JOURNAL

OF THE

Agricultural and Horticultural Society

INDIA.

EDITED BY

THE COMMITTEE OF PAPERS.

VOL. XIV.

PART I.—JANUARY 1865, TO DECEMBER 1866.

ORIGINAL COMMUNICATIONS

"A body of men engaged in the same pursuit form a joint stock of their information and experience, and thereby put every individual in possession of the sum total acquired by them all."—REV. DR. WILLIAM CAREY.

Calcutta:

BISHOP'S COLLEGE PRESS.

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Journal of a Botanizing Tour in Huzara and Khágán in April and May 1859. *By* JOHN LINDSAY STEWART, M. D.

FOR some time previous to the spring of 1859, I had settled to dedicate to a botanical excursion in some favourable district within an easy distance of Peshawur, my 60 day's leave, *i. e.*, if I obtained it, for this boon is at times, by an unhealthy season, put beyond the reach of a Medical Officer in the Peshawur valley where I was then serving.

As none of the Trans Indus Hill-districts are traversible by Europeans, my choice was not a very wide one. To the eastward of the Indus, Kashmir being reserved for a future year, the Huzara hills and the Salt Range were open to me. And I at first thought of attempting the exploration of both in the time at my disposal. The Salt Range however does not probably contain much of botanical interest, and at that period of the year travelling in it would prove rather a hot business. The extent of the Huzara district had also to be taken into account as well as the fact that its botany was almost untouched and so I determined to restrict myself to it. The only previous botanical visitors to the district of whom there is any record are Dr. Falconer who only reached Durbund and afterwards marched through a small part of Huzara, and Dr. Fleming who appears to have gone only as far as Mt. Mochpoora a little to the north of the sanitarium of Murree.

The country called by us Huzara, includes Lower and Upper Huzara; of the latter the Puklí valley constitutes the largest part. The district comprises, roughly speaking, the tract lying to the northward of the Trunk Road as it passes between Rawul Pindee and Attock, is bounded on the east by the Jhelum in the middle part of its course, and on the west by the Indus; and has on the north and N. W. the independent tribes of Pathans who inhabit the country immediately to the southward of the "great bend" of the latter river. From its north east corner stretches northward the narrow valley of Khāgān which is under our rule; and through the heart of the district passes diagonally the road leading from the direction of Peshawur to Kashmir, *via* Mozuffurabad and the valley of the upper Jhelum and Baramūla.

Huzara proper, or in common parlance Lower Huzara, of which Hurreepoor is the capital, is tolerably flat, and in it besides various lesser hills, rises prominently from the plain to the South of Torbela the rugged Gandgarh formerly notorious as the haunt of bands of daring robbers; and considerably to the eastward run the terminations of the spurs of the Murree range. The latter, some miles east of Hassan Abdal dwindle away into the single, narrow, meridional limestone ridge through which the Trunk Road passes at the Margalla, where are still to be seen the remains of a causeway said to have been laid down by Akbar.

Northward and east of Lower Huzara lies that part generally called upper Huzara which is mostly very hilly, and in it the only valleys of more than a mile or two in extent are that in which the cantonment of Abbottabad is situated, and the Pukli valley in which Manserah is the chief village.

Eastward of a line drawn N. and S. through Abbottabad, almost the whole district is covered with hills while westward it is considerably more open.

The only streams in Huzara of any considerable size are the Hurroo, the Sirin and the Dorh. The first rises to the north of Murree, and after a south westerly course, part of which is through a corner of Lower Huzara, falls into the Indus 10 or 12 miles below Attock and about the same distance below the recently formed cantonment of Campbellpore. The Sirin rises in the extreme north east of upper Huzara and after a somewhat shorter south-westerly course falls into the Indus at Torbela. It receives some miles above its junction with the latter, the Dorh which rises not far from the Jhelum river in the east of upper Huzara, flows S. W. to near Hurreepore, and then runs some miles in a N. westerly direction to join the Sirin. The whole course of the Dorh, and the whole of that of the Sirin except the first few miles lie within the Huzara district.

With these few preliminary remarks on the geography of the district I pass on to my journey, but must here note my regret that (without laying stress on the circumstance that I had not sufficient practical geological knowledge even to *observe* to much advantage), my time was so fully occupied with noting, collecting, and drying plants, employments on so large a scale then new to me,—that I am unable to do aught in regard to describing the general geological formation of the country traversed.

Having succeeded in getting my leave I left Peshawur, on 11th April 1859 and went by mail-cart to Attock (40 miles) and on April 12th rode out to Hassan Abdāl (29 miles) crossing the Hurroo about half way from Attock. The Chuch plain which lies between the Indus north of Attock and the Hurroo, is in most parts very fertile, and the dead level of the country near this is only relieved by two small isolated hills of dark hard slate similar to that of Attock, called the *Kamra ka*

Tibba, some 400-500 feet high and lying about four miles to the south of the road.

For a mile or two on either side of the Hurroo the country is uncultivated, being dry, sandy, and furrowed by ravines, and there the principal shrubs are *Acacia modesta*, *Acacia Jacquemonti*, *Gymnosporia spinosa*, and an undescribed *Sageretia* (since named *S. Brandrethiana* by Dr. Aitchison), all of which are common in the lower hills round the Peshäwur valley; the last bearing an eatable fruit called by the Affghans *Mumáni.* These, with *Capparis aphylla* and *C. spinosa*, a few bushes of *Adhatoda vasica*, and in stony places *Rhazzya stricta* and *Cocculus Leæba*, constituted the most of the shrubby vegetation in the uncultivated parts; the most abundant herbs being *Salvia Moorcroftiana* and *Malcolmia strigosa.* The last is common on the frontier, and with its pretty lilac-pink flowers quite carpetted the ground in parts to the east of the Hurroo.

At Hassan Abdāl there is a ruinous *sarái* built by Akbar, who may have passed into Kashmir by this road, and there are still some slight remains of the Hassan Abdāl of Lalla Rookh, in the shape of indications of the celebrated "Wāh!" garden of Jehangir, some ruined-tombs (one of them said to be that of Nur Jehan), and an oasis of verdure watered by a brook which originates in several warm springs, whence the ancient name is said to have been *Jalāl Sur i. e.*, glorious fountain. These supply several bathing tanks, and the pious bathers assert that the springs were originally produced by a stroke of the hand of a Hindoo Saint named Gulāb Dāss. On a stone at one of the fountains is still shewn the mark of his palm whence the ordinary name of the place "*Panji Shahr.*" Another version is that Sheikh Hassan Abdāl (the Bābā wali of Kandahar) on account of a noted fountain which issued at the top of this hill took up his abode, died and was buried there, and an illiberal fakir who succeeded him, having one day refused a drink to Guru Nānak, the latter stopped for ever the flow of the fountain by applying his hand, the stamp of which remained in the stone which was afterwards removed to the foot of the hill. But singular enough, it appears that some years ago the mason who carved the "*panji*" was living in the neighbourhood, if he is not so still! The tanks at these springs abound in *Mahaser* which are fed and protected by the bathing devotees, but I believe the gourmand may by a judicious douceur get a dish of them. Most of the trees about the shrine are the common species of *Morus* and *Salix,* with one or two Cypresses near the tombs; *Rubus fruticosus* is abundant by the streams, *Pteris longifolia* occurs, and the place is noted for its Water-cresses (*Nasturtium officinale*).

On the morning of April 13th, I climbed a hill of some 1,000 or 1,100 feet high, close to Hassan Abdāl, which is composed of the same dark compact limestone as forms part of the higher ranges to the north, the strata here dipping to the northward. Between the latter and this place several other isolated hills and short ridges rise from the plain. On the top of this hill there is a tomb, which I believe some at least of the Sikhs assert to be built over the grave of Bábá Nānak, while the Mussalmans say that Mulla Ali Mortaza a near relative of their prophet lies buried below. The ascent from H. A. is gradual and easy, but I found the descent by the other side towards a small affluent of the Hurroo to be very precipitous and rugged.

The fruits of my three and a half hours ramble were about a hundred species of plants many of which I had become familiar with at Campbellpore and Peshāwur, but I collected all, as I wished to start fair from the plains at Hassan, taking up as far as possible, every plant as I went.

Of shrubs, besides those mentioned as occurring near the Hurroo river (all of which were common here also), I got *Cocculus Leæba* abundant on the river-cliffs; *Sida rhombifolia;* one specimen of *Hibiscus Gibsoni;* a few specimens of *Rhamnus Persica,* common on the frontier; *Dodonæa Burmanniana,* and *Ehretia aspera* occasional.

Of herbaceous plants the following list comprizes the more remarkable:—

Delphinium Saniculæfolium; *Ranunculus auricomus* (?)
Alyssum calycinum, *Sisymbrium Sophia.*
Oligomeris glaucescens.
Linum strictum.
Erodium maritimum.
Peganum Harmala.
Medicago maculata, *Astragalus tribuloides.*
Herniaria hirsuta.
Torilis nodosa, *Bunium sp:*
Galium aparine.
Scabiosa Olivieri.
Sonchus arvensis, *S. oleraceus*, *Centaurea Calcitrapa*, *Cousinia calcitrapæformis*, *Scorzonera new sp: Onoseris lanuginosa*, *Lactuca auriculata*, *Koelpina linearis*, *Picridium Tingitanum*, *Barkhausia sp:*
Campanula canescens.
Lithospermum arvense, *Rochellia stellulata.*
Linaria ramosissima, *Lindenbergia sp: Mimulus gracilis.*
Dicliptera Roxburghiana.
Ballota limbata, *Salvia pumila.*
Plantago amplexicaulis.
Ærua Javanica.
Rumex vesicarius.
Thymelæa arvensis.
Euphorbia Helioscopia.
Asparagus sp: (undescribed?)
Allium rubellum.
Potamogeton crispus, *Chara* and *Marsilea quadrifolia.*

The commoner grasses were *Aristida setacea*, *Cynodon dactylon*, *Chloris villosa*, *Eleusine flagellifera*, *Koehleria phlæoides*, and *Polypogon monspeliensis*; and the less common were *Avena fatua*, *Bromus mollis*, *Chrysopogon sp*: *Cymbopogon Iwa-*

rancusa, *Digitaria samguindlis*, *Melica sp*: *Pennisetum araneosum*, *Poa cynosuroides* and *Sponobolus sp*:

The great majority of these plants are common in the Peshâwur valley, and Trans Indus generally, but some (*e. g. Ærua Javanica*), which are there profuse, begin to be less frequent here.

April 14th, I marched, partly across country, ten miles in a N. westerly direction, crossing the Hurroo river some seven miles from Hassan Abdál. I put up at a small village named Dingee, a little way off the main road to Hurreepore, encamping at a burying-ground by a fine grove of *Acacia modesta.*

The plain near Hassan in this direction is tolerably level, being very rarely broken by deep ravines, and is exceedingly arid with but little cultivation. It has a scanty shrubby vegetation similar to that which prevails towards Attock. *Zizyphus Jujuba* is the most abundant shrub, accompanied by *Acacia Jacquemonti*, *Capparis aphylla*, *Ficus caricoides*, *Buddleia neemda and Calotropis procera.*

All along, *Carthamus oxyacantha* and *Plantago bauphula* were profuse, and besides many of the plants of the preceding day, the following occurred :—

Papaver cornigerum, *Goldbachia lævigata*, *Malcolmia Africana.*

Malva parviflora.

Two or three small *Astragali.*

Francœuria crispa, *Filago Germanica.*

Taraxacum officinale.

Convolvulus pluricaulis.

Salvia lanata.

Chenopodium hybridum.

Euphorbia involucrata.

Zeuxine sulcata was found on swardy banks, and *Adiantum Capillus Veneris* was abundant along ditch sides.

Cynodon dactylon and *Andropogon Bladhii* were the two most frequent grasses.

On April 15th, I proceeded ten or twelve miles, still in a N.

W. direction over an undulating, generally cultivated, plain, with occasional water-courses and streamlets, to Hurreepore the sudder station of Huzara. The latter part of the way was along a good road as at Kot I struck into the regular route from Hassan to Huzara *via* Kale Sarâi. *Zizyphus* was still the chief shrub, but no *Acacia* occurred except at villages, where also were one or two trees of *Ficus Indica* (*pipul*). As I neared Hurreepore *Adhatoda vasica*, of which I had seen none for some distance on either side of Hussan, again appeared; in some fields were extensive matted beds of *Anagallis arvensis* and the following were more or less common, *Papaver dubium Silene Leysseroides*, *Abutilon Indicum*, *Taverniera nummularia*, *Lespedeza juncea*, *Trigonella incisa and Crotalaria neglecta.* A few plants of a very small *Sedum* were got in the bed of a brook, and to-day I found for the first time the thyme-scented *Micromeria biflora* which is common throughout Huzara above this, as it is in the Himalaya generally from 2,000 to 6,000 feet.

During my stay at Hurreepore, Major Becher the Deputy Commissioner introduced me to two of that curious sect the *nikkulseynees* whose peculiarity is that having seen some of the defects of their own (Hindoo) faith, they adopted the late General Nicholson as representing Christianity and civilization, and chose him as their *Guru*, much to his disgust. The few members of the sect have since dispersed, but two of them were after due instruction and examination baptized by the missionaries. Of one of these two men I, on a subsequent occasion saw a good deal and was much interested in him. There was a singular mixture of shrewdness and mysticism in his conversation, which was plentifully interpersed with scraps of Hindi, and *slokes*, but there seemed to be no mistake about his main belief, *viz:* that Hindooism is worthless, and Christianity the best religion known to him.

Major Becher kindly gave me permission to go into most parts of his district, and sent off *parwānas* to procure help for me when needed. I could not however settle the details of my future journeyings until I should reach Abbottabad, for which place I set out on April 16th by the main Huzara road running north easterly, and for some miles parallel to and near the river Dorh. For some distance on either side of the river there was an expanse of low irrigated ground bounded by cliffs and banks from fifteen to thirty feet high (indicating alterations of the place of the river bed). In rambling along by the more eastern of these banks where there was abundance of moisture, I found a good many plants not got in the plains, comprizing several sp. of *Ficus.*

There was a copious arboreous vegetation of *Morus*, *Salix*, *Celtis Nepalensis* &c. the branches of trees were festooned with wild vines (*Vitis Indica* and *V. parvifolia*) and their trunks often covered by a creeping *Ficus* (*F. reticulata*); *Cannabis sativa* was abundant, and the following plants also occurred:—*Sageretia*, *Carissa diffusa*, *Lantana alba*, and *Callicarpa incana; Ranunculus lætus*, *R. muricatus*, *Medicago denticulata*, *M. lupulina*, *Vicia sativa*, *Sedum Adenotrichum*, and another sp.: *Galium tricorne*, *Cirsium Argyracanthium*, *Erythræa centaurium*, *Mazus rugosus*, *Teucrium stoloniferum*, *Rumex Nepalensis*, *R. hastatus*, and *Anthericum sp*:—

After crossing to the right bank of the river Dorh, and going off to the north, the last ten miles to Abbottabad is by a capital road on which the ascent is considerable, being probably not less than 1,800 feet in that distance. Here, as about this height generally in the extreme N. W. Himalaya, there were not very many trees, but wherever there was moisture there flourished an abundance of shrubby and herbaceous vegetation, the details of which however I had not then an opportunity of noting, as it rained hard which made me ride on quickly to Abbottabad from a little village where I had rested and got some bread and milk from the *Malik.* The villagers informed me that they and the mass of the inhabitants of the district are of Pathan origin, and this is I believe confirmed by history, as well as supported by observation of the appearance and character of the people. They are a hardy-looking and robust, well-made race and the dress of those above the lowest ranks approximates to that of the people Trans Indus, consisting of a long loose blue coat, white trowsers approaching those of the Peshawur Pathans in width, a blue mantle with coloured border, and a very voluminous white or coloured turban worn over a Pathan coloured scull-cap.

The people of Huzara are frank, brave, and independent and the Sikhs had much trouble in keeping them down, in particular when they were stirred up to resistance by the fanatic Syad Ahmed who was at last killed in battle with Shere Sing in 1831. Notwithstanding their fondness for war however, they displayed great aversion to leave their native hills for the purpose of entering our military service until the mutiny, when the higher and special inducements offered first enabled the experiment of enlisting them on a considerable scale to be successful. As the *bunyas* appear to be their only medium for getting news and they had never before had an opportunity of cross-questioning a *sāhib*, I had to answer many curious interrogatories, some of which shewed an unsophisticated, others what may literally be termed a sophisticated state of mind. Thus they were very inquisitive about London, Europe, Turkey, the comparative antiquity of the Christian and Mussalman religions, whether we believe at all in Mahummad as they do in Christ, with what we dye the scarlet cloth of which our soldiers *lāl-kurtis* are made (this question evidently concealed some subtle mystery but what that might be they would not say), whether when the said scarlet cloth is being purchased extraordinary precautions have not to be taken to prevent the astute seller from cheating, whether Dhūlīp Sing was made a *krāni* when he got to England, &c. &c.

In passing down this road some weeks afterwards on my return from Huzara towards Murree, I found that the more prevalent or notable shrubs &c in this neighbourhood are these; *Berberis*, *Lycium*, *Carissa*, *Adhatoda*, *Dodonœa*, *Zizyphus*, *Rhus*, *Buckiamela*, two or three *Rubi*, *Bauhinia variegata*, *Acacia Catechu*, *Indigofera arborea*, *Ballota limbata*, *Salvia lanata*, *Rottlera tinctoria*, *Plumbago Zeylanica*, and *Nussiessya hypoleuca*. In going up, although I was drenched to the skin long ere I reached Abottabad, yet I felt so charmed with the freshness of the air and the verdure around me after three years in the plains, that my leading thought was "How can any one tear himself away from these hills?." On April 17th I halted at A. and agreed to accompany some of the Officers of the Sikh Regiment cantoned there, who were to set out next day on a few days excursion into the hills to the northward.

Abbottabad being about 3,600 feet above the sea level, almost all the truly wild plants found near it are different from those I had been accustomed to in the plains. The agrarian vegetation however was, as might be expected, almost identical with the latter and amongst other field-weeds, the following which are also found near Peshawur, were very common. *Capsella* B. P., *Sisymbrium Sophia*, *Neslia paniculata*, *Papaver dubium*, *Fumaria officinalis*, *Silene conoidea*, *Oxalis corniculata*, *Anagallis arvensis*, *Potentilla supina*, *Aplotaxis candicans*, *Sonchus arvensis*, *Lactuca auriculata*, *Lithospermum arvense*, *Rumex hastatus* and *Avena fatua*. In addition to these, the following plants not agrarian, and not found in the plains abreast of this, were not uncommon about Abbottabad: *Sarcococca pruniformis*, *Rubus fruticosus*, *Lathyrus aphaca*, *Micromeria biflora*, *Geranium bicolor*, *Thlaspi arvense*, *Arabis sp*: *Campanula canescens*, and one or two *Carices*.

On April 18th three others and myself set out early in the morning for the range of hills to the northward, the highest ridge of which is called Thundiáni. After crossing the little Nawashahar valley, three or four miles in width, in which Abbottabad is situated, we reached the food of the hills, and exchanged our horses for mules, as being more suitable for the kind of roads before us. Passing over various lower ridges, we got into an upland glen with a stream, up the course of which ran a fair path leading to the camp where part of the Regiment under an European Officer were busy cutting and transporting timber, for the purpose of building barracks for themselves at Abbottabad.

This place was about 5,500 feet in absolute height and as moisture was abundant, there was all round camp a luxuriant vegetation, arboreous, shrubby and herbaceous; the chief trees being *Quercus incana*, *Pinus longifolia*, *P. excelsa*, *Picea Webbiana*, *Pavia Indica*, and *Juglans regia*. *Strawberry*, *Violet* (*Viola Patrinii*) and white clover (*Trifolium repens*) were abundant. Even here the agrarian vegetation of the plains was tolerably well represented; of its members there were *Capsella*, *Fumaria*, *Arenaria serpyllifolia*, *Oxalis corniculata*, *Veronica agrestis*, *Euphorbia Helioscopia* and several others. As it rained all that day I did nothing in collecting the treasures around me; in fact we could hardly stir outside our tents without getting soaked; so were obliged to kill time as we best might with eating and drinking, and "readings" of a Waverley Novel, the only "readable book" any of us had brought up.

Next day (April 19th.) there was a little rain in the morning, but by and bye the weather cleared up, so we climbed the highest peak of Thundiáni (8,630 feet) where there is an old bungalow built by Col. Abbott when he was Commissioner of the district. There were large patches and masses of as yet unmelted snow for some hundred feet below the top. From the latter there is no very extensive view to be got, as this hill is mostly surrounded by others nearly as high, which obstruct the prospect.

Of trees found on this side of Thundiáni *Pinus longifolia* (here called *chil*) had commenced at about 4,000 feet, and occurred up to 6000, but not beyond that; *P. excelsa* (*biár*) was common from 5,000 to the top; *Picea Webbiana* (*paludar*, *var*: *Pinderow*; the other variety *Khutrow*.I got neither here nor elsewhere in Huzara) was less common than either of the two former, from about 5,500 upwards. Of the handsome *Cedrus Deodara* (*deodár*, or in this district more commonly called *diár*) I got no specimen on this hill, but from a distance saw several patches, at about 6000 feet. It is rather uncommon in most parts of the district except in the Khágán valley, where as elsewhere in the Himalaya, it furnishes by far the best timber of any of the *Coniferæ*. *Taxus baccata* (*birmi chila*) was not uncommon about 5000 feet; *Quercus incana* (*ring*) was abundant from 4-6000 and was I think the only oak I got here; but some of it was *possibly Q. Ilex*, as I at first confused these two species. *Pavia* was common, and there were many very fine trees in the dell near the water and at 5,500 and upwards; *Juglans regia* was less frequent about the same place. *Cornus macrophylla* was common, and *Staphylea Emodi* occurred about 6000 feet. The latter is called *chitra* "the spotted," from its mottled bark, whence arises the superstition held by the inhabitants of this district as among the Affghans (by whom it is called *Márchob* serpent stick), that no serpent will come near this tree or its wood. This notion like many of those of early and mediæval medicine in Europe (perpetuated in such names as *Sanguisorba*, *Eyebright*, *Lungwort*) takes its rise from the "doctrine of signatures" in this case applied to the distant resemblance borne by the colour of the bark of *Staphylea* to a serpent's skin.

The more prominent shrubs found near and above our camp were these; *Viburnum cotinifolium*, and *V. fœtens* not uncommon; *Daphne papyracea* common from 8500 feet upwards; *Skimmia Laureola* occasional; a *Rubus* abundant; *Rhus Cotinus* common up to 6000 feet; *Myrsine Africana* and *Spiræa callosa* common; *Clematis montana* was the most abundant shrubby plant and *Hedera* was frequent on rocks &c.

The only *parasite* found was *Viscum album* of which there were several clumps on wild Apricot trees at about 4000 feet;

and throughout the district, I saw no specimen of any of the several species of Loranthus or the other Mistletoes which are found in the Himalaya further to the south east.

The more note-worthy herbs were the following:—*Anemone Falconeri*, *Aquilegia vulgaris*, *Pæonia officinalis*, *Podophyllum Emodi*, *Corydalis rutæfolia*, *Thlaspi perfoliatum*, *T. Arvense*, *Alliaria officinalis*, *Silene inflata*, *Gypsophila cerastoides*, *Linum trigynum*, *Geranium bicolor*, (which has a pretty dark purple flower), *Lotus corniculatus*, *Saxifraga ciliata*, *Scandix Pecten Veneris*, *Galium tricorne*, *Valeriana Wallichiana* (called *Mushkwáli*, and valued for its scented roots which are exported and used in Medicine as *bála*), *Diplopappus molliusculus*, *Androsace incisa*, *Gentiana sp:*, *Amphicome arguta*, *Euphorbia lævis*, *Tulipa stellata*, *Anthericum sp:*, *Gagea lutea* and *Convallaria multiflora*.

As a large proportion of the plants I got were quite new to me I was for two or three days fully occupied with these, and those found at Abbottabad.

On April 20th we descended the glen some three or four miles to Badan or Wadni Ziarat, and had breakfast in a cool, verdant spot by a waterfall, and a delightful cold bath in the hollow of the rock below the fall; going on to Abbottabad in the afternoon.

I had found that at Thundiáni I was too early for even the flowers of many plants, but this I in some measure was able to remedy by visiting this range some weeks afterwards.

On April 21st I rose early and ascended a low hill called Habíba close to Abbottabad on the west, picking up some of those arrears of the flora of this neighbourhood which I had before left.

Of trees and shrubs the following occur here, about 3,500 or 4000 feet above the sea:—*Pistacia integerrima* is a pretty common tree. This is the *Kakkar* of the Himalaya which furnishes a very handsome striped "Zebra wood" timber, the finest for chairs &c of all the Himalayan timbers with which I am acquainted; but the tree which is nowhere an abundant one, has almost disappeared from parts of the hills which are accessible, and where the value put on it by Europeans has long been known. *Kakra Singī* is the name given to hornlike galls often formed on the leaves of this tree which are collected for use in medicine. *Berberis Lycium* is abundant all about, *Punica Granatum* (*dárun*) is not uncommon, and *Olea Europea* (*Kau*) is frequent, but a good deal of it had been cut down for economical purposes. *Indigofera heterantha* and *Lonicera quinquelocularis* are perhaps the most abundant shrubs, and less common are *Xanthoxylon hostile* (the fruit of which though turpentiny is eaten, as well as exported to the plains where under the names of *Tezbal* and *Kabába* it is used medicinally); *Rhus Cotinus* (the leaves of which are agreeably odorous especially when bruised, and are employed in tanning, and whose twigs are used for making baskets); *Grislea tomentosa* (*dhàwī* whose flowers are used as a dye-stuff); *Deutzia staminea* (a pretty shrub with numerous snow-white flowers); *Jasminium dispermum; J. revolutum; and Caryopteris Wallichiana.* Besides the herbaceous plants formerly mentioned the following are more or less common, *Malva sylvestris*, *Hypericum speciosum*, *Periploca aphylla*, *Solanum Trongum*, *Plantago lanceolata*, *Leptopus cordifolius* and *Smilax elegans.*

On April 22nd I only made a start of five miles across the Abbottabad valley to its N. E. corner, encamping at a place called Dumtaur where there is a *zīárat* and a fine grove, and which in former days is said to have been a halting-place for the Mogul Emperors when they took this route to Kashmír. It is a delightfully green, cool, spot with a waterfall, and is a favourite place to picnic in from Abbottabad.

In the grove are a few trees of *Platanus orientalis* planted (I nowhere in Huzara, or indeed in Kashmir the following year, found the plain truly wild), with some fine trees of Mulberry, Celtis &c. abundance of *Rosa Brunonis*, with its long festoons of handsome white flowers, and *Cæsalpinia sepiaria* a tall half climbing *Leguminous* shrub with showy yellow flowers. About the graveyards (especially) here and elsewhere, a handsome blue Iris (*I. Nepalensis*) was abundant. *Fragaria Indica* was also common, with a pretty little pink-flowered *Geranium* (*G. Nepalense*).

Here for the first time I met with the *Amlok* tree, a *Diospyros* (*D. Lotus?*) concerning which I had felt a good deal of curiosity. It is mentioned in various books and papers, under its native name, as a fruit greatly prized by the Affghans, and is to be found in large quantities in the Bazar at Peshawur, whither it is brought from Surat &c. so that I had been naturally desirous to find and identify the tree. Subsequently I got it growing abundantly in many places throughout Huzara from 3500 to 6000 feet, and in 1860 on the return journey from Kashmir, in the upper Jhelum valley below Baramúla. The fruit is sweetish, and pleasant enough in taste when fresh, but would hardly be valued in Europe.

On April 23rd I went on towards the N. E. to Sirpunneh and although the distance is only eight miles, yet as there were many ups and downs on the way, (with, on the whole a considerable rise), and parts of the path had been washed away by the rain, it took nearly four hours for my "traps" to get in. Part of the way the Dorh river ran parallel but in an opposite direction to my course, some hundreds of feet below and to the right (east); hundreds of cedar and pine logs were being floated down its stream from the forests above, for building purposes.

The chief shrubs observed were *Indigofera heterantha*, *Lonicera 5-locularis*, *Xanthoxylon*, *Gymnosporia*, *Sageretia*, and *Viburnum cotinifolium*. A few trees of *Melia Azedarach* (here, as in the Punjab called *drek*) occurred and were said to be wild, but this is very doubtful.

I also observed for the first time *Bauhinia variegata* (which is much rarer in Huzara than in the Himalaya further east); a small shrubby sp: of *Atylosia* (new sp?) called

Jadda; Astragalus rhizantha, Artemisia vestita, and *Inula oblonga.*

Here, as at Abbottabad, the call of the Cuckoo (which has the same name as in English) was a common wood-land sound and quite a treat to me. I had not remarked its call in the plains of the N. W. Punjab.

The first part of the way on April 24th was a stiff climb to the top of a hill on the slope of which the village I had left was built, and over which the road passed, considerably above the lower limit of *Pinus excelsa,* but here there were very few trees of either that or P. *longifolia. Vitis Indica* was not uncommon on the hill, along the top of which the road ran for a mile or two, passing a *ziárat* in a fine pine grove, and beyond this there was a long precipitous descent in the rocky and almost pathless bed of a torrent.

After this as the road was often only a foot path through bushes or along the edge of a declivity, a part of the march was a mere succession of overturns for my mules and baggage. Once the mule-trunk containing my plants, and its fellow with my few dishes &c. were kicked off, and I had the pleasure of watching them roll topsy turvey for many yards down the hill-side. Luckily the specimens were packed so tightly that they got no hurt, but most of my crockery was smashed, so that for some time I had to do as best I might with the red-clay ware of the district.

From some of the higher parts of the road (probably nearly 8,000 feet, being apparently about the lower level of the snow patches on the opposite and loftier hill) there was a fine view of Abbottabad and part of the valley in which it lies, with lower Huzara stretched out far beyond it. Notwithstanding the elevation, this hill, as I have hinted, was almost destitute of the large trees generally found at similar heights, indeed on no part of it was there any approach to a *forest.*

By and bye a still further descent, and then a winding path along the Bírangully valley, part of it in the bed of an irrigation canal, took me to Bojdurrah, consisting of a dozen or two of huts scattered over a considerable area, and belonging to a *jaghīrdár.* The distance from Sirpanneh is probably not more than eight miles but from accidents and the difficult road, my mules took almost an hour to each mile. I fortunately got my tent up ere it set in for heavy rain, which lasted the rest of the day, and made it very chilly and cold (50° F. inside the tent). This place is about 6,000 feet above the sea. Most of the shrubs on the way were the same as those of the previous day the *Berberis* being the most common, *Prunus Padus* (*párus*) with splended pendulous spicate-racemes of flowers was frequent, though hardly yet in full bloom. Its fruits are frequently very much enlarged lengthened from the formation of the gall of an insect, which appears to have caused the name of *Cerasus cornutus* to be given to it by Royle. There were a few *amlok* trees about the Bírangully valley and the so called Neilgherry nettle (*Urtica heterophylla*) was common, but not yet in flower.

On April 25th as there had been much rain in the night I was obliged to halt at B. Employed looking after my specimens and writing "Home-letters," and at intervals amused by the chaunt of a neighbouring *muezzin* whose call to prayers was one of the most sing-song I have ever heard.

Having had no previous experience of wet weather in tents with many specimens in hand, I was here in great dread lest the damp should spoil all I had collected, but I have subsequently found, that even three or four days of the wettest weather does not hurt them much, if during and after that time the papers are well dried at a fire, and the specimens are very diligently turned.

The morning of April 26th still looked gloomy, but I had had quite enough of the dreary little village, and set out for Numle. There was a very steep ascent occupying two hours, during which time heavy rain came on, to the top of the Bírangully hill, about 2,500 feet higher than the village I had left, and 8,600 above the sea.

Here for the first time I got specimens of *Cedrus Deodara*, of which there were a few trees on the ascent. *Pinus longifolia* and *P. excelsa* were abundant, as was *Pavia*. A good deal of snow still lay on and near the top of the hill, on the eastern side of which, towards the river Jhelum, the pines do not descend so low as on the western by which I had come up. This hill is very much admired by most visitors as being plentifully and picturesquely wooded, but it rained hard almost all the time I was crossing it, and I saw its beauties "under a cloud."

The descent is much more gradual than the ascent, and consists of one long almost continuous slope to Numle. This village lies a few miles up the Jhelum from the Kohála Ferry, where the road from Murree to Kashmír crosses, and is situated amid a good deal of cultivation on a tolerably level piece of ground, about a mile and a half from, and several hundred feet above the river. The ten miles occupied me till mid-day, about six hours, the path being in places very steep and muddy; and as I had soon got thoroughly wet through, and there was no chance of my baggage arriving till late, there was no special need for hurry.

In the descent to Numle there was abundant brush-wood of small and large shrubs, of which *Viburnum fœtens* was one of the most common, with *Cotoneaster rotundifolia*, which is here called *Ner* (but in other parts of Hazara, it as well as *C. obtusa* is generally called *lun* or *racuns*) and yields strong sticks, used for bludgeons and the secondary supports of roofs. *Parrotia Jacquemontiana* was abundant, a few plants of *Coriaria Nepalensis* occurred, and down near Numle, *Rubus tiliaceus* and *Nussiecesya hypoleuca* was frequent. At the top of the hill near the snow, *Primula denticulata* was abundant, and all over, *Viola Patrinii*, *Thlaspi perfoliatum*, *Valeriana Wallichii*, and *Euphorbia Peplus* were common. In the fields at Numle, to which large additions were in process of being made by reclaiming from the jungle, a species of *Valerianella* was profuse, along with many of the ordinary spring plants of the plains which I have mentioned as occurring at Abbottabad.

As the rain and the ever-increasing mud made it probable that my tent and baggage would not arrive ere night, I got the assistance of a servant of the Birangully *jaghírdár* who accompanied me, in sending back some men to aid in bringing on my things. The threat he commonly used to induce the villagers to go was, that if they did not assist with the *Sahib's* things, their villages would be sold up! and on my remonstrating with him, he solemnly declared that nothing short of this would make the *begárís* move, so I had to submit and profit by the tyrannical threat.

During the remainder of the day, I and my horse put up in the verandah of the cottage of an old woman who did not seem over proud of my company, and whose *boli*, a dialect of Punjabi, was as unintelligible to me as my Hindustani probably was to her.

At night fall I was obliged to get half of a cottage cleared out for myself, and being then but a "griff" in hill travelling I did not have this so effectually done as it might have been, for although all the human inmates retreated beyond the half partition wall, leaving me the larger moiety of the hut, yet there remained along with me a goat or two, and a young buffalo with his Mamma. My servants and most of the things came up ere I went to bed, but they had been compelled to drop the tents a mile or two back. I at last went to sleep and got through the night wonderfully, considering that among my difficulties were a large number of creeping bedfellows, a constant traffic and cooking, eating, and drinking, going on during the early part of the night at the other end of the cabin, dogs coming in to drink from a vessel of water near my bed-stead, and the young buffalo perambulating the place on little voyages of discovery, in the new world on which he had recently entered.

April 27th. The morning was fine and seeing that I could not move until the baggage got dried and the mules were rested, I set out on a four hours ramble. My stroll led me along the slope of the hill, here composed chiefly of sand stone, to the south, then down towards the river through thick brush wood, and I had a very stiff climb up to the village again through the jungle. Numle is fully 2,000 feet above the river bed, and over 4000 above the sea.

The predominant plants were as follows. *Quercus incana* was the most common tree, with *Cornus macrophylla, Olea, Rhus cotinus, Berberis, Acacia modesta,* and *Pomegranate;* on the lower part of the slope, *Dodonæa* was frequent; I also got here *Sida humilis, Sageretia oppositifolia* (no where so common as the other species), *Pyrus variolosa* (*batangi,* generally called medlar by Europeans, as its fruit becomes sweetish and edible when half decayed), *Ichnocarpus fragrans,* two species of *Heracleum,* and *Scutellaria linearis; Ficus Roxburghii* was occasional, and *Rottlera tinctoria* abundant, the latter called *Kamela,* as is also the vermifuge red powder found on its capsules.

In the afternoon there was much rain with wind, but next day April 28th being fair, I went on ten miles northward to Lower Pattan. The road with many ascents and descents, winds along the slopes of the hills bordering the right bank of the Jhelum (the course of which is here southerly), parallel to and some hundreds of feet above it. The path was very tolerable for the first half the way, though in some parts with but little to brag of as to breadth, but latterly in the territory of the Jaghírdár Nawáb Hussein Khan, there were some very bad bits (under repair at the approach of a traveller!) particularly at one place when a brook dashed in a series of cascades down a very steep ravine. The sand stone of Numle was left behind and the road passed over the limestone, more or less shaly of the offshoots from a high ridge which here runs parallel to the river. The latter was in this part of its course mostly confined by steep rocky banks, between which it hurried along swollen and turbid with the rains of the previous few days.

At Pattan I pitched on a place for my tents below some fine Walnut trees, with pears (*tang*) *Celtis* (*batkar*) *Melia* and *Morus*, forming a little grove.

Near Numle besides many of the plants previously noted, the following were common; *Papaver lœvigatum*, *Potentilla Gerardiana*, *Scandix Pecten Veneris*, *Lactuca auriculata*, *Naphalium multiceps*, *Dicliptera Roxburghiana*, and *Mentha incana*. On the way to Pattan *Melia Azedirach* and *Morus lœvigata* occurred about villages, and *Ehretia aspera*, *Cotoneaster obtusa*, *C. rotundifolia*, *Rottlera*, *Diospyros*, *Gymnosporia*, *Vitex Agnus Castus* (?), and *Grislea tomentosa* were all more or less common; and I also found *Ranunculus arvensis*, *Clemati grata*, *Arabis arenosa*, *Grewia oppositifolia*, *Gouania lanceolata*, *Zizyphus flexuosa* (here for the first time, but becoming abundant after this) *Rubia cordifolia*, *Bidens pinnata* and *Silybum marianum*.

I established myself with my plants &c. until the rest of my things should come up, in the verandah of a *fakír's* deserted hut, and as I had found that mules were quite unfit for the roads I had had, and was likely to have, I resolved to discharge them. About a score of coolies could take all my baggage, and the additional expense would be much more than counterbalanced by their being able to carry on their heads anything, almost anywhere, no matter what the road might be like.

From a rock near the village of Pattan there is a fine view of Chinássi and other snow-clad hills on the western borders of the Kashmír territory to the north east, while many hundred feet beneath, the Kunhár river is seen dashing on in its rocky bed to join the Jhelum a little way below this point. The Kunhár is the stream which rises in and flows through the Khágán valley, and is one of the longest affluents which the

Jhelum receives throughout its course. It is otherwise called by the Hindoos—The Nainsukh, i. e. ease to the eyes, from a story of a certain Raja's lady having in olden times been cured of some opthalimic disease by its waters. On April 29th I went on eight miles northward to Dhunneh; there were many alternate ascents and descents on the first part of the road, and a portion of the path had been quite washed away by the rain, but at last the road descended to near the level of the Kunhár and across alluvial flats, where I got for the first time some specimens of an Alnus (*shrol*) which is occasional throughout the district, and is said to furnish a useful strong timber. (?)

The last two marches along the hill slopes by the Jhelum, had been much more arid and less thickly wooded than the previous ones from Abbottabad on to Numle, and the peasants were complaining bitterly that the drought had blighted their hopes of a good crop.

The chief trees seen on this day's journey were *Pinus longifolia*, which was common below towards the river and *Quercus incana*; a few trees of *Pistacia integerrima* and *Populus alba* occurred. *Berberis*, *Dodonæa*, and *Indigofera heterantha* were the prevalent shrubs, and *Ficus caricoides*, *Nussiessya hypoleuca*, and the yellow flowered, shrubby *Atylosia* were frequent. There was no change from the preceding day in the nature of the herbaceous vegetation. At about one-third of the way from Pattan the road dipped into a deep dell with a brook, near which there were extensive thickets of the *Diospyros* in full flower. Its male and female flowers are on separate trees (always?), which curious enough have received different names from the natives, the male tree being here called *gwalidar*, and the female only *Amlok*.

On the way I got for the first time specimens of a shrubby species of *Elæagnus* (*ghewáin*) which is occasional throughout Huzara. One or two trees of *Albizzia mollis* also occurred.

On April 30th a winding road along by the river bank, then across an alluvial flat, and round a promontory of rock projecting into the river, brought me to Gurhi (eleven miles). The rocks were mostly shaly limestone, with at one place conglomerate overlying it; and there was but little novelty in the vegetation met with.

Rottlera was the prevalent shrub, being profuse all along on slopes above the river, and two vines (*Vitis Indica* and *V. parvifolia*) were abundant, climbing over the trees of *Dalbergia Sissoo* &c. by the stream. ***Zizyphus flexuosa, Ballota limbata, Sarcococca pruniformis***, and ***Alliaria officinalis*** also occurred, one plant of ***Lathyrus angulatus*** was found by the way, and ***Senecio pallens*** was a common weed at Gurhi.

The full name of this place is Gurhi Habíbula Khánka, from the father of the *jaghírdár* who at present holds it, and near it there is a good deal of low, level land on both sides of the Kunhar river on the left bank of which the village is situated. Hugel declares that as in Gurhi there were neither artizans nor agriculturists the inhabitants must all be thieves. Here the Sikhs had a Fort called Futtehgurh, held by a strong garrison, and near this our territory terminates to the east, as the main road to Kashmír at this place crosses the Kunhár by a substantial wooden bridge. The boundary occurs 3 or 4 miles off where the road passes over the crest of a ridge which to the north rises into Sríkot, a hill of about 6,000 feet above the sea, and finely wooded towards the top. Altogether Gurhi with its picturesque village, its river and its bridge, with Sríkot as a back ground to the N. E. and the snowy peaks of Khágán visible up the valley to the N. and W. presented the finest bit of scenery I had yet seen in the district.

On May 1st Sunday I halted and had only a short walk on the low hills to the west, when I found a small species of *Orlaya* profuse as a field weed. In the afternoon I was joined by Captain Davies the Executive Engineer of the District, and we made up an excursion to the top of Sríkot for next day.

The lower flats about the river near this, were composed of shingle with conglomerate occasionally cropping out below, and calcareous shale at times appearing beneath the latter. The low heights to the W. appeared with other patches of similar structure still left clinging to various parts of the hills around the valley, to be the remains of one level expanse, some 60 to 100 feet above the present level of the valley, but of which great part has now disappeared.

Early on the morning of May 2nd we set out for Sríkot, the first part of the way keeping to the somewhat indifferent, winding Kashmír road. At the top of the low crest (called the Dúb pass) several hundred feet above Gurhi, whence we could look over on Mozuffurabad on the Kishengunga, the first village and military post of the Maharajah of Kashmír, we left the road to our right, and turning north climbed the hill by a tolerable foot path, in some places very steep and ascending over slippery limestone. The top of the hill is about 7 miles from Gurhi bridge.

In a lovely grassy glade under some splendid *Deodárs* we made a hearty breakfast, and then started on a ramble, at first along the top of the hill to the north, with a fine view to the north east of the snowy heights of Pír Chinássi. This hill is said to exceed 12,000 feet above the sea, and the forests on it had a tolerably well defined upper edge, below what was then the lower line of snow (most of the temporary annual snow having melted since I saw remnants of it on the Bírangully hill) Thence we clambered downwards a mile or more, and wandered along the well wooded N. E. face of the hill (the S. W. aspect opposite Gurhi is comparatively bare), and then had a very stiff job to get up through the bushes in order to reach our starting point on the summit of Sríkot. The trees about the latter are mostly *Cedrus Deodara*, *Pinus longifolia* and *Taxus baccata*, (no *Picea* was seen here).

It was evening before we got down to Gurhi having walked about 20 miles and enjoyed the day exceedingly. Besides the Pines, the most common trees and shrubs on the hill were these:—*Parrotia Jacquemontiana*, abundant in fruit, both *Cotoneasters*, *Viburnum cotinifolium*, *Pyrus variolosa*, *Prunus Padus*, *Pavia* and *Juglans*, of these *Pavia* and *Parrotia* were the most prevalent trees on the N. E. where the forest and bushes was thickest. From the trunks of many of the former the bark was peeling off upwards in great masses as is the habit of this tree. The bark is exported largely from some parts of the Himalaya to the Punjab plains, where it is used by women under the name of *dindása* as *miswáks* for cleaning the teeth.

The herbaceous vegetation was much the same as on the hills of similar altitude I had previously visited, and included abundance of *Plectranthus rugosus*, (not yet in flower), and the pretty, small white flowers of *Anemone Falconeri* were seen in profusion in shady spots.

The newer or more uncommon plants I got were, of shrubs, *Lonicera orientalis* and *Euonymus Hamiltoni* and of herbs, the following; *Actæa spicata*, *Viola patrinii* (apparently a different variety with darker petals, much narrower leaves, and a stronger scent than that I had formerly got), *Polgala elegans*, (rare) *Geranium lucidum*, *Morina Wallichiana*, *Campanula Thomsoni*, *Tussilago Farfara* (common in a marsh near the top of the hill), *Leontopodium Alpinum*, *Lathræa squamosa* (the only *orobancheaceous* plant found in the whole trip) *Veronica Himalensis*, *Hyssopus officinalis*, *Nepeta ciliaris*, *Hippuris* sp: (?). Many plants appeared to be later in their period of flowering here than on Thundiani.

On May 3rd, I went some miles with D. on his way to Abbottabad, by (not the main road but) a short cut up the Butrássi gully. This is a ravine of 3 or 4 miles long, down which runs a little stream, on whose banks grew some magnificent Alders, with abundance of *Diospyros*, some trees of *Cornus macrophylla*, and a profusion of roses, vines and *Cæsalpinia sepiaria* climbing upon and over all.

On May 4th, in a walk of several miles from Gurhi round by the bases of the low spurs of Sríkot to the northward and back by the river bank, I found the following novelties; *Gardenia tetrasperma, Bryonia umbellata, Chenopodium Botrys, Trifolium* sp: (Cabul clover, cultivated under the Persian name *shotul*) *Potentilla Wallichiana, Bupleurum marginatum, Scabiosa succisa, Lindenbergia macrostachya, Leucas mollissima,* and *Kohautia gracilis* (very rare in Huzara). As the river is here very rapid, and its bed stony, not a single aquatic plant was to be seen.

I set out on May 5th for Manserah to the S. W. and as my baggage was to go all the way by the main road, I again had part of it put on mules, as being the most speedy conveyance when the road is even tolerable, and here it was admirable. I myself took the short road up the Butrássi gully, part of which I had seen two days before. This cuts about 3 miles off the journey, and about 4 miles from Gurhi it joins the main road which is very winding, having been constructed so as to avoid gradients rather than detours. Hence it follows every indentation along part of the eastern edge of the Pukei valley to get to Manserah which lies near the centre of the latter. It must have been close to the east of the Butrássi gully that Hugel, surely the most amiable and griffish of Indian travellers, lost his way and wandered for hours on the road to Manserah. The "Vorgund valley" mentioned by the Baron, must mean the northern part of Pukli, but in his book it is often impossible to identify the names of places, as to the continental system of spelling of Jacquemont, he adds mistakes originating in credulity and ignorance of the native languages, such as sometimes occur in Vigne.

En route I found the villagers were busy celebrating the *Íd*, and I had a pleasant rest in a cool and shady grove by a graveyard at Kotle where a stream runs westward along a ravine to join the Sirin. Here also the agriculturists complained "more suo" "of their fears of short corn" from the drought. The distance of 17 miles I accomplished by midday, and owing to the festival, had great difficulty in getting my small wants as to milk and butter supplied, though not quite so bad as poor Hugel appears to have been in this respect at this very place. There is at Manserah a good bungalow, at first built for the Road officer, and now available to all travellers.

Of the vegetation noted by the way, in the Gully itself, besides *Alnus, Pinus longifolia, Diospyros* and *Melia* the ordinary shrubs of the district were common; *Cynodon Dactylon Andropogon Bladhii*, and *Kœhleria phlœoides* were the prevalent grasses, *Urtica dioica* was frequent and there was abundance of *Adiantum* C. V., and A. *caudatum* with *Pteris Cretica and P. longifolia.*

After emerging from the gully into the open Pukli valley the following occurred :—*Zizyphus vulgaris* (now for the first time in flower) *Inula oblonga, Salvia lanata, Jasminum revolutum*, and *Buddleia neemda.*

I also met with *Euphorbia glauca, Desmodium gyrans, Shuteria sp :, Vicia hirsuta* and *Plantago major.*

On the morning of May 6th I went from Manserah to the top of Breri, a hill which forms part of a ridge that with occasional depression here stretches across the Pukli valley. Two hours took me to the top of the hill, which is some 1,500 feet above the general level of the valley. There are numerous large white blocks of felspathic rock protruding especially near the summit of the hill, and strange to say the very largest which is quadrangular and about 40 feet high, is at the highest point and is visible to a very great distance.

From Breri a splendid view is obtained, including to the N. E. Srikot which I had already been to, and the snowy Pír Chunássi beyond it, to the N. Moussa ka Mousullah, a very lofty snow covered mountain near the mouth of the Khágán valley, and to the west Mt. Bhingrah a prominent and finely wooded hill, which I subsequently visited.

On the hill which was rather arid and bare, and quite destitute of large trees, the common shrubs were *Berberis*, *Gymnosporia*, *Sageretia*, *Rhus Cotinus*, *Rosa Brunonis*, *Indigofera heterantha*, *Bauhinia*, *Acacia modesta*, *Gardenia tetrasperma Rottlera*, and *Daphne oleoides*. A *Vitis* and a *Rubus* were also frequent, *Delphinium saniculæfolia* was common all over, and *Ranunculus aquatilis* was abundant in a small stream half way up.

The only novelties were *Ficus infectoria*, a *sp:* of *Glochidion*, of which there were a few small trees on the rocks at the top of the hill, *Datura sp:* one plant got at the same place, *Cissampelos Pareira* and *Euphorbia longifolia.*

I had came so far back as Manserah from Gurhi, chiefly to meet Major Becher in order to find out if I might have leave to visit the Khágán valley, as its inhabitants are sometimes not pleasant to deal with, and permission to go there was not unrestricted. He arrived in the evening and I was glad to find that he was willing to forward my plans in every way.

May 7th. I spent with Major B. as he had to remain at Manserah to receive farewell visits of the neighbouring Khans &c., on the occasion of his leaving the district. The most interesting of these visitors was a fine little boy, the chief of Tanáwal, and grandson of Páindah Khan, a man well-known in his day for his stout resistance to the encroachments of the Sikhs in this quarter. Tanáwal is a sort of independant territory protected by us, and as Bhingrah hill which I was anxious to visit, lies within it, Major B. kindly arranged with the Khan, or rather with the uncle who is his guardian, as to aid for me in my trip thither.

As these matters were being satisfactorily arranged, an express circular arrived addressed to all officers of the Peshávar division on leave, and ordering them to rejoin their Regiments forthwith. This was particularly annoying to me, but could not possibly be shirked. We made numerous guesses as to the possible cause of this order, some of them wide enough of the mark, and it was not till many days afterwards that I knew it proceeded from the uneasiness among the European Troops caused by the "Transfer to the Crown."

It was wet most of the afternoon and on the morning of May 8th the rain still continued; however orders must be obeyed, I set out for Abbottabad (16 miles) and luckily, ere I had gone far the rain ceased. At Abbottabad I had private word from Pesháwar that for the present the order was in abeyance, and so felt at liberty to start again.

Part of May 9th I employed in roughly copying a manuscript map of the Khágán valley so that I might know where I was going when I should get there. But for the present, as several of the Abbottabad Officers wished to visit Bhingrah, I agreed to defer Khágán, and proceed towards the former, and they would meet me ere I reached the place whence the hill can be best ascended. On May 10th I left Abbottabad and acting on information that the road was a good one I put part of my baggage on mules, but ere I had gone a couple of miles, regretted the step exceedingly, and had to send back for more coolies to relieve the beasts who were constantly falling and throwing the boxes down the "*Khuds;*" (a *khud* by the way is in Huzárá called a *Kas*). I did not follow the newer "*Sirkárí*" road, but took the old, near, one, as likely to be more interesting. After passing along the tops of part of the low range of hills which runs westward from Abbottabad, it dipped into and crossed the Kotiálá valley belonging to Fíroz Khán a *jaghírdár.* The lady inhabitants of this part of the district I found to be more reserved than usual, indeed so much so as generally to turn aside without answering my necessary inquiries as to the road, the thoroughfare being here so little marked as to be constantly confused with cross paths. After rising out of the valley, the path passes along one side and not very far from the top of the highest part of this range, Mount Biliáná, which may reach an altitude of 5,500 feet. Then came a long descent and an undulating road across various low hills, ravines, and brooks to Sherwán, a village prettily situated on a little table-land, and probably about the same elevation (3,600 feet) as Abottabad from which it lies nearly due west.

On the first part of the way, *i. e.*, along the low range of hills west from Abbottabad, *Quercus incana, Ilex dipyrena, Hedera Helix, Zizyphus flexuosa*, and *Allium rubellum* occurred, the vegetation being otherwise the same as that of Abbottabad and the Pukli valley.

In the little strath of Kotiálá lying between the spurs of Biliáná, and along the brook and ravine by which the road leaves it, the following trees and shrubs were more or less common :—*Diospyros, Rhamnus virgatus, Pinus longifolia, Pistacia integerrima, Salix Babylonica, Cornus macrophylla, Olea, Vitex negundo, Flacourtia sapida* and *Nussiessya*; with of herbaceous plants, *Geranium bicolor, Saxifraga ciliata, Fragania vesca, Silybum Marianum, Cirsium argyracanthium* and several Ferns. The higher part of the shoulder of Biliáná was arid and rather bare of vegetation, with no novelties, nor was there anything notable among the plants observed on the long and wearisome descent to Gaddá village. Beyond this to Sherwán *Dodonæla, Rottlera, Daphne oleodes &c.*, were the chief shrubs. The novelties of the day were *Prunus Puddum* occasional, (and not seen elsewhere in the district), *Machilus odoratissimus*, rare, and *Spiræa callosa.* A species of *Phlomis* also occurred, as well as *Polygala oligophylla*, and *Myriacis Gmelini.*

At Sherwán I found that my proposed plan of going thence round to the Northern side of Bhingrah, to ascend it by the easier slope with my Abbottabad friends, would entail on me a considerable detour, so I despatched a missive to the Taná-wal Khán's mother and guardian, asking them to send some of their people to meet me at Merah the place of my next day's halt, from which I resolved to attack the hill on its steep S. E. side.

Sherwán was a favourite resort of Major (now Coll.) Abbott, when he was in charge of this district, and he had built here a small bungalow agreeably situated on a height near the village, but I found it had gone somewhat out of repair, and as my tents were very late in coming in, I preferred sleeping in a "*bùrj*" of the old Fort which serves as a *Thannah* and where I, as usual on such occasions, felt that the creeping inhabitants had a strong objection to a stranger spending the night with them.

On May 11th I traversed the undulating low country to the N. W. towards Tanáwal, effecting in all a considerable descent till I crossed the Mángal, a small stream flowing in a ravine between steep crags which were productive of several novelties; two or three miles beyond this we came to the Sirin river, which is the largest in the district and here forms the eastern boundary of the Tanáwal territory. It took about an hour to get the baggage across the stream, the water reaching to the waists of the men, who were of course obliged to strip, and as the current was rapid, some of the older ones had difficulty in reaching the western bank. All at last got safely over, although only after much trepidation on the part of some of them, especially of my bearer one of the ugliest dogs possible, whose appearance in crossing with his face indicating great dread and his closed umbrella held aloft a la Squeers (that it might not be wetted I presume) was most laughable. We then traversed an arid desert tract, with rock frequently cropping out, occasionally sandstone but generally felspathic (as at Mt. Breri) and at last reached Merah village, lying north-west of Sherwán, a few miles to the north of which Mt. Bhingrah loomed large. Here there was a good deal of cotton cultivation about villages. This is considerably lower than Abbottabad (probably not much over 2,000 feet above the sea) and the last part of the way, the heat was rather oppressive. The road (12 miles) took seven hours.

The predominant plants to the east of the Mángal river were those usual at similar heights throughout, and at the stream itself *Nerium odorum* was abundant, and *Sedum adenotrichum* and *Linaria sp:* (near *L. ramosissima*) were common on the cliffs on either side. Between the Māngal and the Sirin and on to Merah the common shrubs were *Zizyphus Jujuba, Acacia modesta, Vitex negundo, Gymnosporia* and *Calotropis*, with *Carissa* in full flower, varying from white to pink, and scenting the air for a long way around. Beyond the Sirin (where vegetation was very scanty) I for the first time got the *Olea* in flower.

The plants hitherto unnoted or rare were these; *Acacia Catechu* (here as else-where called *Khair*) which was common the greater part of the way; *Mimosa rubicaulis* (*rál, riiaul*) also common; *Hiptage madablota,* on the rocks at Māngal river, and neither got before nor after this; *Flacourtia sapida* (*Koo-Kāi*) abundant most of the way; *Grewia betulæfolia* not uncommon below Sherwán; *Cryptolepis reticulata* occasional; a species of *Asparagus,* a *sp:* of *Boucerosia* (frequent Trans Indus,) *Statice sp: Plumbago Zeylanica* and *Commelynum* common. The last five only occurred at the Māngal, and of the *Statice, Commelynum* and *Boucerosia* these were the only specimens I got during the whole trip.

In the evening I discovered that Merah village could not produce enough carriers for my baggage, and that the neighbouring villages belonging to a *subjaghírdár* of the Tanáwal Khan objected to give any assistance. So I had some of them up and explained to them that although I of course could not compel them to come, yet I was on terms of correspondence with the *Mái sáhib* (lady mother) of the boy Khán, who might possibly object to any European visitor to the territory being detained even a day for want of a few coolies. I wound up by ordering a *putwári*, the only man who could write, to be called next morning at day break in order that if the requisite number of men should not be present, I might at once send off a note to my lady correspondent to tell where and how I was detained. I was agreeably surprized next morning, May 12th, to find that my solemn threat of over-night had had the desired effect and that the necessary number of *Muzúrs* ("hired men") were in waiting.

A two hours walk in a N. westerly direction, the latter part of it up a slightly ascending gully, brought us to the villago of Mahowá where the *Muzúrs* had breakfast. We then kept westward up the course of a small stream which comes down from the dip between the two peaks of Bhingrah, the path getting more and more steep at every yard. After some three miles of this a Jemadar of the Khan rushed up to me with the most profuse apologies for being so late in catching me up. My note to the *Mái Sáhib*, of the 10th from Sherwán, had arrived at the metropolis, Umb, on the Indus to the westward of this, at *namáshi weli* (Punjab and Huzara for *namáz ke wakt,)* on the evening of the 11th, and he, the Jemadar had been at once sent off with orders on "life and death" to hasten to serve me. He had ridden to Merah during the night but only reached it after my departure and so had posted on after me. I may note that during the few days I staid in the Tanáwal Khán's territory, I received every possible attention and civility from this man and the other officials with whom I came in contact.

The last part of the way—path there was now none—to the top of the gully between the two divisions of the hill was particularly stiff, and there was a good deal of difficulty in getting my two nags up some parts, but it would have been very inconvenient now to send them round by any other route, and I thought that as I had climbed, so they could, and up they came.

In the dip of the hill I made a halt of three or four hours to enable the tired *Muzúrs* to come up and rest. As there are no villages on the hill about Mahowá, I should have had at all events to take these carriers to the top, and on offering them the option of staying here all night, or going on to the top at once, they preferred the latter. So at 4 P. M. we began to climb the remaining 600 or 800 feet, which was very steep, and exceedingly difficult to climb in shoes, owing to the pine leaves strewn all over the hill side. We in the first instance arrived at the wrong side of piles of immense blocks of rock which lie on and near the summit of the hill, so had with some difficulty to circumnavigate these, and at last reached the very top, where in former times was the *baithak*, and now is the tomb of some holy *fakír*. I had just time to pitch my tent ere night fell. There was no level place to pitch on, and even the least sloping part was such that, had it been desirable after that day's work, I might have got some tolerable hill exercise without going outside.

In the first part of the way from Merah and up as far as Mahowá, the vegetation was similar to that of the previous day or two, consisting chiefly of *Berberis*, *Rhus Cotinus*, *Gymnosporia*, *Sageretia*, *Indigofera*, *Grislea*, with some *Alnus* and *Pistacia integerrima* near water. At the flat on which Mahowá is situated (about 4500 feet above the sea) and in the ravine above it the *Pistacia* was perhaps the most frequent tree (being much more abundant than I know of its being *any where* else in the Himalaya) and *Salix Babylonica*, *Alnus*, and *Dalbergia Sissoo*, were common near the brook. *Bauhinia variegata* increased in frequency and luxuriance towards the top of the gully, *Rubus tiliaceus* abounded, *Caryopteris Wallichiana* occurred, and *Clematis grata*, *Rosa Brunonis* and *Vitis vinifera* climbed luxuriantly over the trees

Further up the ravine, were fine trees of *Cornus macrophylla*, and there was a good deal of *Pinus longifolia*, which however by and bye ceased. *Quercus incana* was very frequent, fine and large, indeed I no where in the District saw such forests of this tree as here; and the following shrubs &c. were common, *Lonicera 5 locularis*, *Deutzia staminea*, *Urtica heterophylla*, *U. dioica*, *Linum trigynum*, *Androsace incisa*, *Smilax elegans* and *S. maculata*.

Near the top of the gully, which is about 7,500 feet above the sea, other two species of *Quercus* (Q. *floribunda* and Q. *laxiflora*) made their appearance, with *Cotoneaster*, and *Rhamnus virgatus*; the species of R. found below having been *R. Persica* which is like a shrub by variety of the former, and is common in the lower parts of this District, and on the Trans Indus Hills. In the dip between the two peaks were fine trees of *Pavia*, *Pinus excelsa* and *Picea*; with *Viburnum fœtens*, *V. cotinifolium*, *Euonymus fimbriata*, another species of *Euonymus*, and *Prunus Padus*; also *Podophyllum Emodi*, *Pæonia officinalis*, *Datura sp*: *Valeriana Wallichii*, *Saxifraga ligulata*, *Gentiana sp*: and *Hypericum perforatum*.

Towards the top of the hill, *Taxus* and *Pinus excelsa* were the most common forest trees. I was told here that the Khutrees below, sell the leaves of the Taxus under the name of *Jalbatri* as a cure for colic &c. and get equal weights of coppers for them. *Staphylea Emodi* was more common on this hill than I saw it anywhere else in the District.

The chief plants of this day previously unnoted were these:— *Rhus Buckiamela* found also on the skirts of *Biliáná*, and here not uncommon; *Odina wodier* of which, at about 4000 feet, was found a single tree, the only one I saw in the District; the two Oaks, both of which afford strong and useful timber for making ploughs &c.; *Rhamnus purpureus* and the two *Euonymi*. Also near the top of the Hill a third species of *Asparagus*, *Krascheninnikovia rupestris*, a species of *Pedicularis*, *Convallaria verticillata*, *Eremurus spectabilis*, and *Cephalanthera ensifolia*. The last was the only Orchid I found in Huzara.

In my tent at 9 P. M. the temperature was 65° F. and at first the feeling of coolness was rather chilly and unpleasant than otherwise, after the heat I had for some days experienced below.

As *Bhingrah* has none but much lower hills near it there is generally an extensive prospect on almost every side to be had from its top, but on the morning of May 19th the view was much contracted by a haze.

On looking across the Indus some few miles distant to the West, at the celebrated *Mahában*, I was hardly prepared to see that it appears to consist of a mass of hills, of nearly equal altitude and that there is *no one* great peak rising far above his fellows as I had supposed was the case from the map, and some of the accounts of it by those ingenious men who imagine it to be identical with *Aornos*, as well as from the much nearer though more partial view we had had of it from its western side, when out on the *Eusofzái* Frontier Expedition under General Cotton, the previous year.

Most of this day I was busy with the plants collected on the 12th, and in exploring generally the vegetation near the hill top; which as calculated from the B. Pt. of a small thermometer, is about 8,500 feet above the sea level.

In the afternoon I had word that three *sáhibs* from Abbottabad had made their way half up the hill from the north side, and would join me the next day, merely to return however in the evening.

My friends arrived in the morning of May 14th and I had a ramble of 2 or 3 hours, getting some novelties. We then took breakfast and about midday set out to descend the hill. I found the northern slope to be immensely easier than that (on the S. East) by which I had ascended on the 12th.

The chief plants noted were the following. About the top of the hill, in addition to those remarked the previous day, *Podophyllum Emodi*, *Clematis montana*, and *Dioscorea deltoidea* were very common. Down to about 5,000 feet above the sea, *Viburnum cotinifolium* abounded, *Quercus incana* became abundant, as on the South eastern aspect (the other two *Oaks* stopping ere it began to prevail), and *Artemisia vestita*, *Nepeta ciliaris* and *Cephalanthera ensifolia*, were common. Below 5,000 feet *Berberis* and *Myrsine Africana* were frequent, the *Elæagnus* was profuse at a brook, *Hedera Helix* occurred, and one small tree of *Albizzia mollis* was seen. Still lower the vegetation was scanty, and the plants were the same as those generally found at similar heights.

The novelties of the day were these; *Acer sterculiaceum* and another (new?) species, both called *trekhan* occurred from the top of the hill to about 5,000 feet; a species of *Salix* was not uncommon and *Populus ciliata* occasional on the descent; one or two trees of *Andromeda* occurred about 5000 feet, the latter being with one exception the only one of that genus I found during the whole excursion; a species of *Sedum* was abundant on rocks at the top of the hill, *Nepeta Govaniana* occurred, also high, and a species of *Impatiens* was very common near the top, but too young for diagnosis.

About 4. 30 P. M. we reached the village of Bojdarrah which is situated in a warm low valley, probably not much over 2000 feet above the sea, with a sluggish brook in which grew abundance of a tall *Saccharum* (*S. exaltatum?*) The place was formerly noted for its garden, of which some scanty evidence still existed, in the shape of a large grove of Apple trees, *Olea*, *Zizyphus flexuosa*, *&c.*

In these parts there was a fearful night bird (possibly the *Cuculus micropterus* if I may judge from the call as described by Jerdon) but I did not see it and am no ornithologist if I had, who kept up for hours a mocking yell of "whoo-*whoo* whoo-*whoo*" that did not tend to a comfortable night's rest in those subject to be disturbed by such sounds. If the maledictions of the unhappy could affect him that dread bird must have long since perished in agony.

I found from my friends that my chosing the Tanāwal "lady mother" to write to for help had been a happy "fluke", she being a shrewd woman, who at the death of her late husband Jehāndad Khān a few months before this, fearing some treachery from his brother towards the child he left behind him, had first secured the forts of Umb &c., and sent word to the officer in charge of Huzārā for his support, then only making the death publicly known.

On May 15th my companions returned to Abbottabad and I spent the day at Bojdarrah. I hardly know what credence I can put in one bit of information I got here, *viz* that the men of this part of the country eat twice, many three times a day, and the labouring zemindārs *four* full meals daily.

On May 16th I proceeded 10 miles to the north east over the low, dry and bare hills lying between Bojdarrah and the Sirin river, into the Pukli valley on its western side, and encamped close to Malikpur a small village on the right bank of the Sirin.

Near Bojdarrah the shrubby vegetation was similar to that usually met with in such low dry warm valleys, and consisted chiefly of *Dodonæa*, *Rhus Cotinus*, *Olea*, *Rottlera*, and *Ficus caricoides;* while of herbaceous plants *Delphinium saniculæfolium* was more abundant than I found it anywhere else in the district and *Cirsium argyracanthium* and *Aplotaxis candicans* were common. Less frequent were *Gymnosporia*, *Pistacia*, *Indigofera arborea*, *Rosa Brunonis*, *Rubus tiliaceus*, *Celtis*, *Nerium odorum*, *Filago Germanica*, *Artemisia elegans*, *Eremostachys sp*: and *Solanum Trongum*.

Pinus longifolia was not uncommon on the low hills, where also the following occurred; *Zizyphus Jujuba*, *Grislea*, *Gardenia tetrasperma*, and *Vitex negundo; with Cissampelos Pareira*, *Polygala oligophylla*, *Rubia cordifolia*, *Campanula canescens*, *Scabiosa succisa*, *Cyperus niveus*, and *Andropogon Bladhii*. At a streamlet were found *Ranunculus aquatilis*, *Samolus Valerandi*, *Mimulus gracilis*, *Plantago major*, *Polygonum flaccidum*, and *Equisetum debile*.

On emerging from these low hills into the Pukli valley and leaving the Tanāwal territory, the common shrubs were *Punica Granatum*, *Daphne oleoides* (its yellowish berries nearly ripe) *Indigofera heterantha*, and *Jasminum revolutum*; and the prevalent herbs were *Linum strictum*, *Anagallis arvensis*, *Valerianalla*, *Galium aparine*, *Rubia*, *Centaurea calcitrapa*, *Cousinia calcitrapæformis*, *Convolvulus arvensis*, *Veronica anagallis*, *Dicliptera*, *Plantago bauphula*, *Thymelœa arvensis*, and *Cymbopogon Iwaruncusá*. A large proportion of these herbs are common in the plains of the N. W. Punjab.

Further on in the valley the road lay among cultivation through lanes formed by dense brushwood, consisting chiefly of *Zizyphus flexuosa*, *a Rubus*, *Sageretia*, and *Indigofera*.

On the way *Cichorium Intybus* was not uncommon; besides it the only novelties of the day were, *Grewia oppositifolia* of which there were one or two plants at B.jdarrah, and *Vincetoxicum Arnottianum* and *Thesium sp*: of each of which only a single plant was found.

The inhabitants of Malikpore (and its neighbourhood) are Swáties, that is Patháns who came originally from the Swát valley which lies beyond the Indus to the North of Peshawur, and I found them rather inclined to be "independent", a circumstance which caused some delay in getting coolies to carry my baggage on May 17th. All the way to Shinkiár (nine miles) the road was pretty level, and ran nearly parallel to the river, but I diverged from it to cross some low outlying spurs of the Tangläi hill, which to the westward of this divides our territory from the independent valley of Agror. From one of the spurs issued a small chalybeate spring. To get into Shinkiári we had to cross to the left bank of the Sirin, the baggage &c. by a rather difficult ford, and I by a bridge composed of one long vibrating plank put up by the "*Sircar*" to prevent accidents. These I was told, were formerly very common in fording the river owing to its rapid stream and the sudden floods to which it is liable.

I pitched near a small bungalow built for travellers on the site of a former Sikh Dhurmsala, where there were a few fine planes, poplars, alders, and peach-trees and some copious springs.

On the way the vegetation was very similar to that seen on the latter part of the previous march, the only novelty being a new variety of *Polygonum aviculare.*

I was here visited by the Khán of Konsh, a district beyond our territory to the Northwest, said to be a very *yághi* and dangerous one.

He was a particularly mild-looking civil fellow, and I showed him some pictures of Runjeet Singh and other Punjab notables, of which as usual with untrained natives, he made but little.

On making enquiries as to whether the *julghoza* (the edible pine nut, *Pinus Gerardiana* of Affghánistan, Pangi and Kunáwur) is got above this, I found that the nearest approach to it is the dry, innutritious, turpentiny seed of *Pinus longifolia* which the hill-people occasionally use as food when very hard

The village of Shinkiari, (about 2,000 feet above the sea) picturesquely situated on a small alluvial flat, surrounded well wooded hills on almost every side except the south, in which direction the Sirin passes out into Pukli plain.

Here as at Bojdarrah I was tormented by the vile night-bird with his " whoo *whoo*-whoo *whoo*."

At this point the rivers Sirin and Kunhár are within a few miles of each other, being separated by a ridge some 2000 feet higher than the valley of either, and this ridge I had on May 18th to cross in order to get into the Kunhār valley on my way to Khágán. I had a little rain on the ascent, which is a pretty steep one, but the rest of the forenoon was fine, and after we had crossed the tolerably well-wooded hill, there was a capital road northward to Bálakot about 14 miles N. N. E. from Shinkiarí. ***En route*** near Shiwála village, where I remarked curiously carved little stones set up at either end of graves (similar to those I had seen in the Mahában country beyond the Indus), I had an amusing talk with an unsophisticated villager, who never having seen a cheroot before, was very much puzzled by this new kind of

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hukka, and kept asking over and over again "Is it *all* tobacco?"

I arrived at Bálakot just in time to take shelter in the *bálakhana* of the *thánnah* from a very heavy shower, but by and bye my tent arrived and I got comfortably settled down.

On the ascent of the hill above Shinkiári the common trees and shrubs were *Pinus longifolia*, *Quercus incana*, *Indigofera arborea*, *Grislea*, *Sageretia*, *Rottlera*, *Ficus Roxburghii*, and *Colebrookia oppositifolia;* and the most abundant herbs were *Ajuga parviflora*, *Micromeria biflora*, *Taraxacum officinale*, *Cyperus niveus*, *Adiatum c. v.*, and *Asplenium adiantum nigrum.*

About the top of the hill the following were observed, *Pinus longifolia* (the only Conifer seen on this ridge) *Alnus*, *Salix sp: Andromeda ovalifolia*, *Pyrus variolosa*, *Elæagnus*, *Myrsine*, *Sarcococca*, *Cardamine hirsuta*, *Galium aparine* and *Leucas mollissima.*

On the descent the following occurred; *Rhus Buckiamela*, *Cornus*, *Hedera*, *Cissampelos*, *Hypericum perforatum*, *Lotus angustifolia*, *Saxifraga ciliata*, *Jnula oblonga*, *Senecio pallens*, *Androsace incisa*, *Nepeta Govaniana*, *Polygonum bistortum* and *Imperata Kœnigii.*

In the Kunhár valley, to the level of which here *Pinus longifolia* does not descend, there occurred in places elevated plateaux similar to those remarked at Gurhi some miles below this; and there were seen here besides, many taluses of gravel stretching from the base of the hills on the east towards the river, and which in the wider parts of the valley lower down reached a mile or two in length.

Below Balakot, *Dalbergia* was abundant by the river, and the following also occurred, *Albizzia mollis*, *Daphne oleoides*, *Alnus*, *Jasminum revolutum*, *Deutzia staminea*, *Adhatoda*, and *Teucrium stoloniferum*, and at the gravel plateau on which the *thánnah* is built I found *Gouania lanceolata* and some plants of *Plumbago Zeylanica.* The latter I only got in one other place in the district.

The novelties of the day were *Symplocos cratægoides*, common on the hill top, *Desmodium gangeticum*, *Crotalaria albida*, *Ainsliæa pteropoda*, and *Dipteracanthus prostratus.*

On the morning of May 19th we crossed to the left bank of the Kunhár by a long wooden bridge, just broad enough for a horse to walk on with comfort, which was fixed on high piles of stones at either end to prevent its being reached and carried off by floods. After a considerable ascent, the road then ran along the hill-side for some miles, many hundred feet above the now turbulent Kunhár, the valley of which above B. becomes narrowed into a mere glen, with the magnificent snowy *Mousa* towering ten thousand feet above to the west.

For the last three or four miles the road led to the right away from the river, up the glen of a small feeder, to the village of Kawái (ten miles from B.) the residence of the first of the Syuds who rule the valley of Khágán, and whose territory is entered very soon after crossing the bridge.

On the bank of the river at starting *Coriaria Nepalensis*, *Amphicome arguta*, *Urtica dioica*, and *U. heterophylla* were common. The rock here cut through by the stream appeared to consist chiefly of a red shale, with a considerable dip to the northward.

For some distance above this, the hill side, except near occasional streamlets, was very dry with no pine or other large trees, and but little herbaceous vegetation; and the chief shrubs were *Acacia modesta*, *Zizyphus flexuosa*, *Punica*, *Rhus Cotinus*, *Rosa Brunonis*, *Sageretia*, and *Ballota.* *Cornus* was occasional near water, with abundance of *Vitis*; and the commonest grasses all over were *Bromus mollis* and *Aristida setacea*, both indicative of aridity.

By and bye the following became common, *Acer sterculiaceum*, *Diospyros*, *Rhamnus purpureus*, and *R. virgatus*, with

Clematis grata, *Deutzia*, *Hedera*, and *Leptopus cordifolius*. Streams now became more frequent, one of them forming a very fine water-fall by dashing over a cliff some 50-60 feet high. Amongst the jungle below, *Parrotia Jacquemontiana* was abundant.

The vegetation of the lateral valley in which Kawái is situated, afforded but little variety from that previously noted. The novelties of the day were *Edwardsia mollis* (*buna*) *Abelia triflora*, *Spiræa Lindleyana*, *Fraxinus Xanthoxylloides* (common just below K.) *Marsdenia Roylii*, *Impatiens leptoceras*, and *Polygonum Fagopyrum*.

At Kawái which on the MS. Map is marked 4000 feet, but that is probably a good deal under the real height, I encamped at a graveyard under a grove of peach and walnut trees with bunches of *Viscum album* on the branches of the former. I had a visit from Záman Sháh the Syud of the place, a very wily looking old gentleman, who was particularly civil and attentive. His Moonshí was the only man above Bálakot who could read or write, so I employed him to pen an *incisive* note to the thanadar of that place, wigging him for not having sent along with me a bunya to supply my Hindustání servants with rice &c. This was quite necessary as Indian corn is almost the only cereal to be got in any quantity above this and it is not congenial to the Hindustaní taste or digestion.

On May 20th there was some rain with wind in the morning but it soon cleared up. We first went down the side of the lateral valley opposite to that we had ascended the previous day, towards the Kunhár river which, after a long and steep descent, was reached at the village of Párus, the residence of another of the Syud-rulers of Khágán. The rest of the way to Jeríd (10 miles from Kawái,) there is a tolerable path running along near the river, moisture and vegetation being very much more abundant than they had been the day before.

The first part of the way from Kawái the prevalent trees and shrubs were *Pinus longifolia*, *Fraxinus Xanthoxylloides*, *Indigofera heterantha*, *Acacia modesta*, and *Rhus Cotinus*; and a species of *Heracleum* was abundant.

On the descent to the river over a rather arid slope the following were more or less common, *Acer sterculiaceum*, *Quercus floribunda*, *Diospyros*, *Parrotia*, *Celtis*, *Amygdalus Persica*, *Prunus Armeniaca*, *Punica*, *Salix sp: Viburnum cotinifolium*, *Spiræa callosa*, *Rubus lasiocarpus*, *Clematis grata*, *Edwardsia*, *Rosa Brunonis*, *Abelia*, *Nepeta Govaniana*, *Leucas mollissima* and a species of *Phlomis*.

Beyond Parus, while ascending the Kunhár valley not far from the level of the river, the following were the chief trees and shrubs observed; *Cedrus Deodara*, *Juglans regia*, *Pistacia*, *Rhus Buckiamela*, *Pyrus variolosa*, *Cornus*, *Pavia*, *Populus ciliata*, *Deutzia*, *Spiræa Lindleyana*, *Jasminum*, and *Sarcococca*.

On a flat close to the river were some very fine trees of Populus alba, and *Cedrus Deodara*. The latter being here low and sheltered, retained the fragile top of the stem which is so frequently broken off, thus giving to this tree the flat-topped tabulated appearance it in many places ordinarily presents.

After passing Bhoorja rivulet and Kus the *Deodar* become more common, with *Pinus excelsa*, *Prunus Padus*, (in fruit) *Elæagnus* and *Viburnum fœtens*.

The novelties of the day were the following, *Morus serrata* occasional, *Cedrela toona* abundant and fine, *Buddleia crispa*, a new species of *Berchemia* frequent, *Phytolacca racemosa* only 1 or 2 plants, *Oxalis acetosella*, a species of *Galium*, and a spinous *Astragalus* (*Makhmal*) like those of the Tibetan type which are found in Kunawur and Affghánistán.

The village of Jerid which is about 5,000 feet above the sea, is picturesquely situated on the right bank of the river several hundred feet above it. It is inhabited by Swáties who, being in a minority in the valley, and holding their territory on equally favourable terms with the Syuds are proportionately disliked by the latter. I encamped on the left bank, as the road up the valley lies on that side, on a level bit of ground near a wooden bridge leading to the village.

The whole of Khágán above Páras, is more a deep glen than a valley, the hills on either side being very steep and lofty, and almost no level pieces of ground occurring. The sides of these hills are in most places well wooded, and wherever there is moisture, as near brooks and below by the Kúnhár, there is also abundance of shrubby and herbaceous vegetation.

At Jeríd I purchased a young black bear which had been dropped by its mother, she having escaped with the other cub. He appeared to be not more than a few weeks old, and for some days pined a good deal, and there was some difficulty in supplying the place of his absent mamma, but he at last got over this, and I brought him down with me, and afterwards kept him for nearly two years. When I was obliged to destroy him (on the occasion of my leaving Peshâwar) he was a well-grown fellow, and had continued quite manageable, but appeared to have very little attachment or acuteness in his composition. This the black bear is occasional in the lower part of the valley, but above Khágán, all the bears are I believe of the rufous grey species.

The path from Jeríd to Khágán along the left bank of the river is tolerably good, but in going up on May 21st there were several hours of rain which made the road disagreeably muddy, and in one or two places it was a good deal broken down by the previous rains. We now occasionally passed patches of snow in sheltered spots. The river in great part of its course rushed thundering along in its narrow bed among huge blocks of rock. On the way the formation passed over appeared mostly granitic, a greyish white felspathic rock occasionally occurring for some distance.

En-route we passed Bela, which 15 or 20 years before had been the scene of a tragedy of which a Sikh burkándáz who accompanied me gave me the following account. The Sikhs who then ruled the Punjáb, determined to send a force from Huzárá up the Khágán valley, for the avowed purpose of attacking Chaláss, a country on the Indus beyond it, and had arranged matters with the Syuds for a safe passage through the valley. But the latter had suspicions as to their real intentions, and so contrived that Díwán Ibrahím, the commander of the Sikh force should at this place be a little in advance of his men. Suddenly four Khágánís started up from behind a rock and fired at the Díwán and his two or three attendants. One of the bullets took effect on the Díwán, and the Khágánís rushed in hundreds from their hidding-places, and made an onslaught on the Sikhs. The latter although probably much more numerous than any force that this thinly peopled glen could turn out, were astounded by the death of their leader and the suddenness of the attack, and made no effective resistance, and their assailants completed the business so well that very few Síkhs escaped to tell the tale of the massacre.

The common trees &c., seen on the early part of the way were these; *Salix sp: Ilex dipyrena, Celtis Caucasica, (kái)* and *C. Nepalensis*; (here as in Huzárá called *batkar*); *Elæagnus, Lonicera quinquelocularis, Vitis vinifera, Smilax elegans, Taraxacum,* and *Valeriannella.* I think one or two trees of *Pinus longifolia* occurred at one place, but *Cedrus deodara* was the common conifer.

After passing Mausoor kí Gallí where a largish affluent comes down a lateral ravine on the eastern (left) bank of the Kúnhár; and where the rock was schistose, with a considerable dip to the south, there were some fine trees of *Pavia,* not yet in full flower, and it became abundant further on; *Juglans, Cedrela* and *Pinus excelsa* were all common.

Above Belá the prevalent shrubs were *Parrotia, Buddleia crispa, Daphne oleoides,* and *Zizyphus flexuosa*, and there were dense thickets of *Desmodium tiliæfolium*, to the tenacious bark of which Dr. Cleghorn has recently directed attention as likely to be of value for paper making and textile purposes. It is a very common shrub in many parts of Huzárá and if the cost of carriage do not interfere, could be had in almost any quantity. *Saxifraga ligulata*, and *Sedum adenotrichum*, with *Capsella B. P.*, *Thlaspi perfoliatum*, and other *Cruciferæ* were common in damp, shady places.

The novelties of the day were these; *Acer cultratum*, and *Cratœgus oxyacantha* occasional, *Sambucus Ebulus* (with a most fetid smell of burnt flesh) *Adonis æstivalis*, *Astragalus rhizanthus*, *Artemisia maritima*, *Nepeta raphanorhiza*, and *N. linearis*.

A mile or two below the village of Khágán, which is 12 Miles from Jeríd, I met the young son of one of the three Synd brothers who reside there. He turned back with me, and I was well received by his two uncles, his father, the youngest brother, being absent.

As my tent was not then up I took breakfast surrounded by a crowd of spectators, who do not often have the chance of seeing a "*Faringí*" feed, only five Europeans I think having previously been so far up.

During the afternoon as well as several times afterwards in the course of my stay at Khágán, one of the younger members of the Syud family came in to detail to me all their grievances. How they had been banished to Shinkíarí for three years merely on the false evidence of enemies (the Swáties of Jerid) who had informed the *Sircár* that they tyrannized over their ryots; how their relative at Kawáí and the Swáties had invariably been listened to and preferred before them and how as a grand wind-up disgrace, they had not been summoned with the other chiefs of the district to bid farewell to Major B. ere his departure. As it is not often they get an opportunity of opening their minds to a *Sáhib*, I considered it a duty to listen to all this, and much more in a similar strain, assuring them however that I had not a shadow of influence is such matters, that some of the seeming slights though deeply to be regretted had simply been owing to their distance from Abbottabád and so on.

I was much amused by the way in which these outer barbarians received various items of information about Europe, *e. g.* they simply listened and stared when told about our ships, railroads, and telegraphs, but when I said to them that in our country ploughing was done, not by bullocks, but by horses they nudged and whispered to each other and cross-questioned me as to how horses could be managed in a plough, and evidently did not believe a word of it, while I dare say that had I told them we had the Phænix or the philosopher's stone in our *wiláyat* they would at once have swallowed it.

The name Khágán is applied not only to the whole of the valley but more particutarly to this part of it (*Kháss Khágán*) as well as to the capital. The last is probably about 7,000 feet above the sea (in the M.S. Map it is marked 7,500 feet) and is composed of several hamlets, each of the Syud brothers inhabiting a separate one, situated some half mile distant from each other, on slopes several hundred feet above the river on its left bank. Although the valley here widens a little, *i. e.* the slope of the hills on this side at least is less here than usual, yet there is almost no level ground, nearly the only possible cultivation being on a patch of a few acres down by the river, and one or two places on the less steep parts of the hill sides. It is surrounded by lofty snow clad mountains which had a very striking appearance in the bright moonlight. The people consider Sirool, to the S. E. to be the highest peak in this district and from this point it certainly looked a stupendous mountain.

May 22nd being Sunday, I halted. The thermometer in my tent at 5 A. M. stood at 45° F. and at the hottest part of the day, at 70° F. The cold I suppose makes the inhabitants late risers, and also prevents from bathing in the Kúnhár.

At this season its waters are almost entirely derived from melted snow, (there was a great deal still unmelted but a little above this level on the surrounding hills) and a dip would be most unpleasantly cold. I was told no one above Bálakot can swim.

The wooden bridge across the river had been carried away by a recent flood, and several scores of the villagers were engaged during most of the day in hauling down some pine logs from the forest above to make a new one, being encouraged in their labour by a great amount of drumming, singing, and squealing *more Pathánico.*

A young officer on a shooting excursion from Peshâwar (who has since perpetrated a book on his sporting adventures in the Himalaya) having pitched his camp two short marches further up the valley at Nárang, I set out on May 23rd to get at least so far, and as carriers were not abundant, I left most of my baggage behind me, taking only 6 or 7 men's loads, including a small tent and the essentials for a few days, in case I should find it advisable to go beyond N.

Above Khágán there was still a tolerable path, generally running close to the river's edge. At a bridge by which the (best) road crosses to the right bank, 3 or 4 miles above Khágán I was met by Mír Gul the youngest of the three Syud brothers and had a few minutes' talk with him. He was very civil and had the repute and appearance of being the shrewdest of the three. The eldest brother Futteh Ali did not seem a man of much energy or intelligence; and the second, Anwar Shah, though apparently acute enough was the most truculent looking personage I had met. He was said to have had a considerable share in planning the massacre of the Sikh force at Bela, and had the personal disadvantage of being somewhat disfigured by a *goitré* (here called *gal*) one of the very few I saw in the district.

Six or seven miles above Khágán, after passing the hamlets of Rajawál, Bagnú, and Nerewela we came to the small village of Paludar. This is generally reckoned a stage, but I went on to Narung (12 Miles from Khágán) a miserable squalid looking collection of 8 huts on a small level stony spot on the left bank of the river. Here we were not far from the level of the lower edge of the snow, and *en route* had crossed several masses of it close to the stream, of several hundred feet in extent and sometimes many feet thick.

On the road, I passed and had some conversation with a merchant of Tor a district beyond Khágán, to the N. W. His languago was (of course) quite unintelligible to me and sounded unlike any Indian tongue I am acquainted with, but he having in the course of his life made some 10 or 12 mercantile journies down as far as Ráwul Pindí, knew sufficient Hindustani to tell me that the "goods" he was in the habit of taking down were gold, gems &c. and he had with him two coolies carrying his return cargo of cheap cloth. His home was about three long stages beyond this, but his road would take him off to the left (west) leaving the Khágán valley a few miles below Nárung. Between Khágán and Nárung the following were the more prominent trees and other plants. *Cedrus deodara* was abundant. It is here called *palúdar* which is the name given in Huzárá to *Picea;* of the latter, here called *reyan* or *rewari*, there were dense forests on the higher parts of the hills, and one or two trees down near the river; *Pinus excelsa* (here as in Huzárá called *beár*) was not so common as it had been on the outer hills. These three Pines during the first part of the way were only visible on the hills far above the river, but the forests soon advanced to the bank on both sides, the trees however not being so densely placed down near the stream. *Populus alba* was abundant, being one of the commonest trees in Khágán along the river banks, and *Populus ciliata* gives its name *bagni* to one of the hamlets above noted as *Cedrus* does to another; *Prunus Padus* was common, and the following were more or less abundant; *Viburnum cotinifolium*, and V. *fœtens* (with a less common variety having leaves of a much darker colour) *Acer sterculiaceum*, *Rhamnus virgatus*, both *Cotoneasters*, *Clematis montana*, *Fragaria vesca*, *Urtica heterophylla*, *Sambucus Ebulus*, and *Pæonia*, hardly yet in flower. *Dioscorea deltoidea* was abundant. Here it is called *Kriss* as in Kashmír, where its root is extensively used in washing silk.

The following novelties occurred; *Abies Smithiana* (*kachan*) of which only one or two small trees were seen, and which I found nowhere else throughout the trip; *Ulmus Wallichiana;* a species of *Fraxinus* (*sumb*) which occurs (as in Kashmir where its wood is used in preference for making oars) in various parts of Huzárá, and which affords a valuable timber; *Myricaria Germanica* common on islands and low flats; *Ephedra Gerardiana* in quantity on the low grounds just at Nārung; *Pyrus Kumaonensis* frequent; *Ribes leptostachyum* common the latter half of the way; *Rosa Webbiana* frequent but not yet in flower; *Caltha palustris* abundant in several marshy places; *Barbarea vulgaris* and a species of *Cardamine*, *Lamium petiolatum*, *Onosma echioides*, *Anchusa moltkioides*, *Myosotis sp:* *Cynoglossum sp:* and *Veronica Beccabunga.*

In the evening Mr. B. the sportsman I expected to meet, returned from an unsuccessful day's search for game. Partly on the "omne ignotum" principle, and partly also because one of the first European officers who visited Khágán was lucky enough to make a good bag of ibex after a severe snow-storm, this valley had acquired a great name for sport, but this was B's second visit to it, and his experience went to qualify that belief. He, with Coll. M. had been up the previous winter, and with some trouble got as far as Lake Laloo Sur, at the head of the valley some 25 miles above Nárung whence the Kúnhár rises, but found no ibex. On the present occasion, although a most active and enthusiastic sportsman, he had, in five weeks, only bagged one musk deer (*rouns*) and four adults and a cub, of the rufous yellow species, of bear (*richh*) which is much larger and at such heights more common than the black. He had at first encamped a march and a half above Nárung, but game was scarce, and coolies nearly as scarce, so he had to return. At Nárung itself it would be impossible to raise more than half a dozen men for carrying purposes, and above it there are only one or two still smaller hamlets. So although the Syuds had empowered me to take on my present carriers as far as I might think fit, seeing there was nothing but snow a little way above Nárung, and political reasons prevented me from trying to get over into Chaláss, I resolved to retrace my steps. The next day however was to be dedicated to visiting what was laid down on the M. S. map as "Lake and Mountain Suffee Mulook 12,000 feet," a few miles to the right (eastward) of where we then were. Nárung itself is probably more than 9,000 feet above the sea.

B. had found that in case of rain, of which there had been a good deal, and which converted the whole ground into a swamp, the best place for pitching a tent was on the top of one of the huts of the village, there being plenty of hold for the pegs in the two feet of earth composing the upper stratum of roof. Guided by his experience I had mine pitched thus, and luckily, as during the night there was much heavy rain.

On the morning of May 24th about half past 6, we set out for Suffee Mulook, B. taking his rifles in case of our seeing game. For a mile and a half hour our way (path there was none) lay along a lateral glen, with but few trees, up the course of a small stream which comes down from the lake and joins the Kunhár at Nárung; after thus making an ascent of some 500 feet, we reached the lower edge of the snow through which, softened as it then was by the sun, walking was by no means an easy process. We then ascended the steep face of a hill for the rest of the way passing through a small wood of Picea and by and bye got at the "Lake." This we found to be a deepish pond of some few hundred yards in extent, surrounded by marshy ground, and lying in the lowest part of a valley encompassed by bare, gaunt and craggy hills probably 1,500 feet higher than its level. The ascent of about four miles occupied fully 3 hours. In a place tolerably free from snow we waited for more than two hours for the man carrying our kettle &c., to enable us to prepare some breakfast. In this interval we became very hungry, and B. having shot a bird not unlike a black-bird and having a yellow bill, (called *káhzín* and probably one of the choughs), the only *game* procurable, we roasted it and notwithstanding its very bitter flavour ate it with some relish and much mirth; and both felt sorry that B. failed in stalking our victim's mate, who was too wary to be shot. At last the truant coolie made his appearance and we had a somewhat more civilized and palatable breakfast.

This place is put down at 12,500 feet (I could not find that the officer who made the map had been at the lake) but the B. P. of water by my small thermometer did not make it more than 10,000 feet. The instrument however was not at all suited for this purpose, and it is probable that some of the heights given in this paper may be considerably under the mark (I must except several in Huzara *e. g. Thundíaní* and *Srikot* which had been taken by more accurate methods).

In the afternoon an hour and a half's walking brought us down to our tents at Nárung.

The principal plants observed during the day were as follows. *Cerus deodara* and *Picea Webbiana* common, to above the lower level of the snow; *Acer sterculiaceum* and *A cultratum* only to a short distance above Nārung; *Prunus Padus* common nearly to the snow; *Rosa Webbiana* and *Ephedra Gerardiana* stopping a little above the village; a *Rubus; Indigofera heterantha*, up to the snow; *Sambucuss Ebulus* to a short distance above the village; *Cannabis satiea* abundant near the latter; *Gagea lutea, Corydalis rutæfolia*, and

Artemisia scoparia abundant up to the snow; and *Thlaspi perfoliata, Caltha palustris,* a *Sedum,* *Androsace incisa, Onosma echiodes, Myosotis sp:, and* two small *Ferns; Cystoperis sp: and Cryptogramma sp: (?)*

These comprize almost every plant seen above Nārung except the following novelties:—*Betula. sp:* (*Bhojpatra*) was common with the leaves in bud, and was seen in clumps to the top of the hills surrounding the lake. I had also seen it the previous day, and picked up some pieces of its bark which had been brought from above by the melting snow. Of *Juniperus excelsa* (*charái*) a few small branches were found in the stream but no trees were met with, *Anthericum sp:* was common up to the snow, *Veronica biloba* was most abundant (below &) to some distance above the village, and *Craniospermum sp:,* another *Boraginaceous* plant a species of *Pedicularis, Allium sp.* and a new species of *Colchicum* were found to only a short distance above Nārung.

On May 25th there was some rain in the morning but I sent my things off, and by and bye set out for Khágán bidding good bye to B., who subsequently again went some miles up the valley, where he got but little sport to repay him.

As I had been very particular in looking for novelties on my way up to Nārung I did not expect, or find, many in going down, but was mostly occupied in noting the points at which I first met with the various plants (thus indicating though rather vaguely their comparative range of elevation), and observing the frequency &c. of those I had neglected on my journey up. *Populus ciliata* was abundant and *Euonymus fimbriata* frequent up to Nārung, and below a ravine called Dasori Kas two miles from the village *Juglans regia* became common, and the following were more or less abundant, *Podophyllum Emodi, Astragalus rotundifolius, Tussilago Farfara, and Polygonum Fagopyrum.*

About four miles below Nārung occurs *Bemal kus* a glen running up between two hills to the westward. By this route went the "forces" of the Syuds in 1857 to intercept a large body of Hindustáni sepoys who having escaped from the Peshawur valley had made their way among the mountains to within a long march of this place. They got but little mercy from the Khāgānis who had an opportunity of at the same time shewing their loyalty to the British, and of venting their hatred on the Poorbeas, not to mention the Government reward and the chance of picking up some plunder among the fugitives. Those I believe they took care to blockade and starve before attacking them, and having killed many, captured the rest whom they sent down to the authorities in Huzārā, where some scores of them were blown away from guns, in order to give " a great moral lesson" to the inhabitants.

Below the half way village Paludar, *Pavia, Dalbergia, Berberis, Viburnum cotinifolium* and many others made their appearance.

The only new plants found on the way were a second *Ribes (R. rubrum ?)* of which one plant was seen some miles below Nārung.; and *Orchis latifolia* and *Iris Kumaonensis*, of each of which a few occurred in one place.

After I reached Khágán there was a thunder-storm accompanied by very heavy rain, and the cold was so piercing that I was obliged to have a small fire lit under the veranda of the tent. This place being set high on the hill side and unsheltered by forest, seemed exposed to every cold blast that blew.

On May 26th although I had informed the Syuds of my wish to start for below, they did what they could to prevent my moving on that day, kept me waiting a long time, first for their own appearance, and then for that of the coolies, and indeed were impolite generally, but at last I succeeded in getting off. With all this they insisted on showing the attention of accompanying me a mile on my way, and might have gone further, but I walked smartly on purpose, and by and bye the wheezing of Anwar Shāh, who was asthmatic as well goitrous, obliged them to cry halt and turn back. To tell the truth I was not sorry to bid them good day, as at one time I feared that their perseverance in throwing obstacles in my way might lead to complications.

The twelve miles to Jeríd occupied 5½ hours and among the plants I noted as commencing were the following: *Elæagnus, Hedera, Deutzia, Abelia,* and *Viola Patrinii,* all of which occurred above Bela village, while below it began *Vitis vinifera, Zizyphus flexuosa, Rosa Brunonis, Edwardsia, Olea, Jasminum revolutum, Buddleia crispa, Daphne oleoides,* and *Ficus caricoides;* and of herbaceous plants, *Filago Germanica, Nepeta raphaorriza, Cymbopogon Iwarancusa, and Bromus mollis.*

Below *Natani kas,* (in the brook issuing from which the ladies of a neighbouring village were engaged at an exaggerated version of "Scotch washing") the following appeared: *Pistacia integerrima, Rhamnus purpureus, Punica granatum, Fraxinus xanthoxylloides, Adonis æstivalis, Lactuca auriculata, and Smilax elegans.*

The novelties were these, an *Acer (New sp: ? near A. Cretica)* again found the succeeding year in the upper Jhelum valley below Baramula; a species of *Rhus,* of which a few tall trees occurred, and the fruit of which a Khaganí tried to dissuade me from gathering as he said it would burn my hands dreadfully, but no such effect was produced; *Lilium Thomsonianum* of which only 3 or 4 plants were seen, and which I met with nowhere else on the trip; *Epimedium elatum,* for the first time in flower; and a species of *Cynanchum.*

I found the Swäties of Jerid much more energitic "*Khidmatgárs*" than the Khāgān Syuds had been, notwithstanding the boastings of the latter, and on May 27th I got my coolies sharp and was able to start early. There being many ascents and descents on the road to *Kawái,* the ten miles took me nearly six hours. About half way lies the village of *Páras,* the residence of another of the Syud rulers of whom I have only heard. It is well built and prettily situated on a tolerably extensive flat on the left bank of the river; from a little above it on the opposite bank commences the ascent of Mousaka Mousulla. The dense forests skirting its densely snowed summit looked tempting enough, but my leave was so nearly exhausted that I could not afford the two or three days necessary to climb it and was obliged to leave it untouched. After quitting the vicinity of the river at *Párus*, there was a very stiff hot ascent (with a profuse growth of *Serratula pallida)* of a mile and half to get fairly into the lateral valley of *Kawái.*

When I reached that place Syud Zamān sháh proved as before very attentive, much more so than his relatives of Khágán. Notwithstanding his civility to strangers however, it would appear that he is at times not overkind to his near relatives, at least there is a story extant that on one occasion he burned out an uncle from a house in which the latter had taken refuge and then dispatched him.

The plants noted as recommencing on the way were the following; *Diospyros*, *Pyrus variolosa*, *Myrsine Africana*, *Leptopus cordifolia*, *Berchemia*, *Sageretia*, *Spiræa callosa*, *Rhus Cotinus* (usually quite a small shrub, but here at times a tree of tolerable size) *Campanula canescens*, *Hypericum speciosum* and *Aplotaxis candicans.*

Pinus longifolia first reappeared in any quantity on this march, although I think I noticed one or two trees at Bela above Jeríd. The upper limit of this tree seems to be much lower in these extreme N. W. Himalaya than in Kumaon, Gurhwal and further to the south east.

The novelties of the day were *Caragana brevispina*, *Geum urbanum*, and a species of *Pouzolzia*, of each of which only a few plants were got.

Kawái is marked in the MS. map as 4,000 feet above the sea but I made it several hundred feet higher and it cannot be very much lower than Jeríd (4,700 feet) seeing that the latter is near the level of the Kunhár, while the former is placed high in its lateral valley.

Here I was somewhat amused by watching the way in which those who came to visit me tried to dodge my young bear, so as to prevent him from touching their clothes, (bears being among the unclean animals of the Mussalmáns, so that contact with him would have entailed washing before prayers) without at the same time shewing disrespect to me as his proprietor.

On May 28th I set out for Bálakot, and at the foot of the Kawáí valley where its little stream joins the Kunhár, at the Panjus kas, three miles below Kawáí, I took the low road running along near the river, instead of that by which I had gone up, and which passes along the hill side several hundred feet above and about a mile to the left.

At one place I found that the path, just below a high cliff, had been quite washed away, leaving some four feet of water close up to the rock which I got through ignominiously, astraddle on a man's shoulders. On my declaring the water looked very deep and asking my carrier if he had not better repeat his "*Kalma*" ere we trusted ourselves to it, he very quietly and innocently accepted the suggestion and did so.

The ten miles to Bálakot took about 6 hours. Near the river the new *Acer* with 3 pointed leaves was common, *Dalbergia* (coming into flower) was abundant, and *Ballota limbata, Solanum Trongum,* and *Chenopodium Botrys* occurred. No novelties were found. Ere taking leave of the Khágán valley I may note the fact that in it I did not see a single specimen of any species of Oak, common as several of these are on most of the hills in Huzárá. This is analogous (si licet parva &c.) to a similar absence of Oaks and *Rhododendrons* in the Kashmir valley and the hills immediately surrounding it, a circumstance which was first remarked by Dr. Falconer 30 years ago, and has been confirmed by all subsequent botanical visitors, and has yet to be accounted for, since it can hardly be accepted as an ultimate fact.

Athough there is a sort of cross-country road to Manserah from Bálakot, yet as taking it would not have saved time, I arranged to go round by Gurhi, to which I went on May 29th, the first part of the way being the same as that by which I had come from Shinkíarí.

The ten miles to Gurhi took about five hours, and there was not much to note regarding the vegetation. I found no novelties and the shrubs were those ordinarily seen about this height (2,500 feet) such as *Rottlera, Callicarpa, Ficus Roxburghii, Grislea, Buddleia crispa, Vitis* and *Cæsalpinia sepiaria.* On the level land in the valley near and above Gurhi there was a good deal of cotton of which there had been none above Bálakot, and I found it still hotter (96° in the verandah at the hottest) than it was at the latter place.

On May 30th, in going to Manserah, I took the longer, main road through the Doom Gully instead of cutting off three miles by the Battrassi gully as I had done on a former occasion. The first part of the road winds for 6 or 7 miles over the low dry hills which separate the valley of the Kunhár from the Pukli plain. These consist mostly of a schistose rock, and a good deal of *Pinus longifolia* grows on them. At one place there were a set of furnaces for the destructive distillation of the wood of this tree in order to procure tar for the wood work of the Government bridges. *Quercus incana* also and *Pistacia integerrima* were not uncommon—otherwise there was nothing notable in the vegetation—indeed I had travelled over two thirds of the ground before. A place on the road as it passes along the eastern edge of the Pukti valley gets its name of *chitti wat* (white stone) from several large blocks and hillocks of white felspathic rock containing large crystals, the same as that of the blocks on the ridge of Breri a few to the S. W. and like them visible from a great distance.

I found the heat at Manserah to be greater even than it had been at Gurhi and the thermometer stood at 100° F. in the verandah at the hottest part of the day.

When I had formerly visited the *Thundiání* range, I was quite new to the hill plants of the district, and thus apt to get confused by the numerous novelties met with, so I was anxious to have another look at it, and determined to cross it on my way to Abbottabad, although the natives gave bad accounts of the steepness and difficulty of the ascent from this side. I therefore sent on by the regular road to Abbottabad my horses and most of my servants and "traps" and left Manserah on the morning of May 31st for *Thundiánī.* It was unfortunately a very hot cloudless day for the journey, some parts of which were very fatiguing, more so than any of my previous experiences (although I have had a much more trying climb since on the arid Trans Indus Frontier)—so that I took 9 hours to what cannot be much more than 12 miles.

The first part of the way lay nearly due east across part of the undulating Puktli district, and over low ridges; and the ordinary shrubs were *Rhus Cotinus*, *Xanthoxylon*, *Rubus lasiocarpus*, the two *Cotoneasters*, *Spiræa callosa*, *Indigofera heterantha*, *Myrsine*, *Vitis* and *Daphne oleoides*. *Cichorium Intybus* was a common weed here, and *Cynodon dactylon* and *Imperata* the most frequent grasses.

At the large village of Data (about 3500 feet above the sea) which I reached after 2 hours walking, there were a good many trees of *Juglans*, *Cornus* and the *Diospyros*. The last however is said not to be common and not to ripen its fruit in this part of Huzárá. After a rest and a draught (my first, and *last*) of *lassi*, a painfully acid preparation of milk, which the aborigines are very fond of, I commenced the ascent and the vegetation began to change. I presume that at this height and latitude the shortness of the summer crowds the *rabi* and *kharif* into each other, as the Indian corn was springing and the wheat hardly ripe. *Quercus incana* was the most common tree, *Pistacia integerrima* and *Rhus Buckiamela* occurred, and *Indigofera arborea* and *Berberis* were the prevalent shrubs. The Barberries here however were not nearly so pleasant and sweet as I had found them in some parts of the district, and these local differences in the flavour are said to be commonly observed.

After following for some distance the dry bed of a stream in a ravine, where my thirst from the exertion in the hot sun was excessive, and not a drop of water attainable, I after some more climbing reached the last large village of *Turnawái* ere which point one has left the dry, bare lower hills and got into the moist green zone. Here I rested and got some milk as a relish to my dry biscuits from the *Mustázir* (head man)—who at the same time fed the chuprassi who accompanied me. He with rare simplicity for a native, assured me that his pleasure in regaling the Chuprassie was greater even than that of supplying my wants, as although I was *sahib* and so *a hakim*, the Chuprassie was a Syad and therefore a man especially to be reverenced and made much of. Here there were some fine copious warmish springs with a legend attached, but unfortunately (?) I omitted to note it. The rock on to the top of the range, was a non-fossiliferous limestone. Above *Turnawái* there is but little cultivation and the hills are well covered with forest, *Pinus longifolia* being now abundant, and *Juglans* common in the valley by which I ascended. The heat obliged me about midday to call a halt, and beg some milk at Gadráni a hamlet of 2 or 3 cowherds houses, in a well wooded and watered ravine where were many splendid trees of *Pavia Juglans*, and *Prunus Padus*. Above this for some distance the forest consisted almost entirely of *Quercus incana* among which *Viburnun* was the only frequent shrub. A particularly steep climb up a dry bare hill under a blazing sun brought me to *Shahzáda* village with scanty cultivation, beyond which there was very little ascent, the road winding along a low part of the summit of the ridge.

The forest here consisted chiefly of *Pinus excelsa* and *Picea Webbiana*, with *Pavia*, *Juglans*, *Acer sterculiaceum*, *Morus serrata*, *Cornus macrophylla*, *Viburnum cotinifolium* and *V. fœtens*. *Pæonia officinalis*, *Potentilla Gerardiana* and *Scrophularia decomposita* were the commonest herbaceous plants.

The village of Merah where I staid the night is about a mile to the north of and considerably higher than the wood-cutting camp of the Sikh regiment, whence my friends and I had formerly ascended to the top of *Thundiání*. The latter lay to the S. E. some 2,000 feet higher than Merah which is about 6,300 feet above the sea.

As the men who brought up my few traps were fearfully fatigued with the march, I gave them an extra *douceur* for their exertions. I had here occasion particularly to remark what sooner or later strikes every traveller in the Himalaya, viz : the immense distances at which the inhabitants in hallooing from hill to hill can make each other hear and understand. In doing this they repeat and dwell upon the final word of the sentence or phrase and effect their object very much better than we with much stronger lungs and voices can hope to do. A less pleasant subject of meditation was the loss of a useful Coddington lense which I discovered I had dropped at Manserah while packing in the morning twilight, but I was afterwards lucky enough to recover it through the good offices of the Civil Officer at Abbottabad, although its silver setting must have been rather a temptation to the finder.

Staphylea Emodi was frequent near Merah. Its distribution in Huzárá appears to be local, for although I also got it sparingly on Bhengrah (and subsequently at Murree) I found none at similar heights on Bírangallí or in the Khágán valley. *Prinsepia utilis* likewise occured near Merah, and also *Jasminum officinale*, *Lamium petiolatum*, *Nepeta Govaniana* and *Prunella vulgaris*.

On the morning of June 1st, there was some rain, but not enough to stop progress and I walked the 12 miles to Abbottabad in little more than 4 hours, great part of the way, although the road is rugged in places, lying down hill. I had gone over this ground before so that I found nothing particular to note in regard to the Flora.

I wished to see the vegetation about Murree so as to be able to compare it with that of Huzárá and Khágán, and resolved to spend the few remaining days of my leave in making a detour round by that place and on to Rawul Pindee, whence I could in 12 hours reach Peshávar by mail cart.

Accordingly on June 2nd, I sent on my baggage about mid-day and myself followed soon afterwards. I have previously noted the chief plants occurring above where the main Huzárá road is left at Lángrí village and the road towards Murree turns off to the left (east), after crossing the river Dorh. There is no very well marked track by the route I took, so I contrived to lose my way, but made out to get as far as *Sajkot* (16 miles from Abbottabad) which I only reached about half past 9 at night, having come the last part of the way up a dark gully and across some miles of cultivation by the aid of a torch. When I arrived, almost none of my baggage was up, I had great difficulty in rousing the *mustázir* in order to get some bread and milk, and, to crown all, very heavy rain came on, compelling me to take shelter for the night in a cow-house. Warned by previous experience of insidious enemies, I kept on my waterproof coat and leggings, and whether owing to the chemical or the mechanical properties of these out-works I know not, but I remained scatheless, and had, all things considered, a tolerably comfortable night's rest.

The plants noted on the part of the road to the east of *Lángrí*, while daylight lasted, were those usually found at similar heights (about 3,000 feet) and comprized the following; *Diospyros* (only about villages), *Punica granatum*, *Pyrus variolosa*, *Rosa Brunonis*, *Pistacia integerrima*, *Olea*, *Viburnum cotinifolium*, *Clematis montana*, *Berberis*, *Indigofera arborea*, *Lonicera quinque locularis*, *Sageretia*, *Smilax elegans*, *Cissampelos*

Pareira, Potentilla Gerardiana, Prunella vulgaris, Dicliptera Roxburghiana, Micromeria biflora, and *Teucrium stoloniferum.*

Most of my baggage had on account of the darkness, stopped some miles short of *Sājkot,* but came up early on the morning of the 3rd June, and we went on. For the first mile the path was a horrible one, along a brook ravine over and among rocks, and the whole march I found most tedious, the road being very far from straight, either from a vertical or horizontal point of view, while the ridges crossed were mostly bare and uninteresting and the heat was great. At the village of Pírkot to the eastward of the Hurroo river, which we crossed, I rested a while and had some tea &c. and when I got into Gāríní about dark, felt dreadfully tired with my day's work although I should think the whole distance is not over 14 miles.

During the march the following plants were more or less frequent; *Vitis vinifera,* and *V. parvifolia, Zizyphus vulgaris, Rhus Buckiamela, Amygdalus Persica, Spiræa callosa, Rubus lasiocarpus, Dalbergia, Acacia modesta, A. catechu, Atylosia sp: Grislea, Cornus, Viburnum fœtens, V. cotinifolium, Lonicera quinquelocularis, Rubia cordifolia, Inula oblonga, Onoseris lanuginosa, Amphicome arguta, Nepeta Govaniana, Phlomis sp: Sarcococca, Ficus caricoides* and *Nussiessya.*

The height probably ranged from 2,500 to 4,000 feet above the sea, and most of the hills were very dry and tree-less, there being almost no trace of forest on even the highest of them, and very little thick brushwood on any part, nor was the country thickly inhabited or much cultivated.

The only novelty was *Itea nutans* (*lelar*) of which, near the Hurroo, I found one tree, the only specimen seen in the whole district.

At starting from Gāríní on June 4th I had very great difficulty in getting coolies to convey my baggage the remaining 8 miles into Murree; indeed I had to go so far as to oblige the *mustázir* himself to carry a load for a short distance, which piece of oppression had the desired effect. This was the most "*yághí*" place I passed through in my trip, and no wonder, seeing that, as I found out afterwards, it was this part of the district which "rose" during our troubles in 1857, and from which a body of insurgents assembled for the purpose of attacking the station of Murree which they kept in dread for some time.

For three or four miles of the way, I ascended by a tolerable path over bare hills, after which I got on the main road from Rawul Pindee to Murree, and after a rise in all of 3,000 or 3,500 feet, reached the sanatarium, which is beautifully situated on and round the well-wooded top of one of the finest hills in this district, at 6,500–7,000 feet above the sea.

The following plants were observed on the ascent, ere reaching the main road,; *Prunus Armeniaca* (fruit now ripe and being carried to Murree for sale), *Quercus incana*, *Ficus Roxburghii*, *Viburnum cotinifolium*, *Jasminum dispermum*, *J. revolutum*, *Colebrookia oppositifolia*, *Vitis vinifera*, and *V. parvifolia*, *Inula oblonga*, *Samolus Valerandi* and *Polygala oligophylla.*

After reaching the road, the following occurred on the hill on which Murree is situated; *Cornus*, *Quercus incana*, *Salix sp:* *Populus alba*, *P. ciliata*, *Acer sterculiaceun*, *A. culefatum*, *Prunus Padus*, *Coriaria*, *Viburnum cotinifolium*, *Cotoneaster obtusum*, and *C. rotundifolium*, *Jasminum revolutum*, *Lonicera quinque locularis*, *Rubus lasioscarpus*, and *Leptopus cordifolia.* All of these are more or less common to the top of the Murree hill.

I staid at Murree for two days (June 5th and 6th) and did not go far out of the station, but employed myself in noting, especially, the trees and shrubs of the main hill and its neighbourhood. In the Flora there is not much difference from that of the parts I had previously traversed, less indeed than I had expected.

As I have said, the whole of the ridge is or has been, well-wooded, but on the part of it embraced in a walk of 3 or 4 miles round by the shady moist northern side, locally called "the Forest", the vegetation both arboreous and shrubby, is most luxuriant though in some places getting thinned for firewood &c.

Besides the trees and shrubs I have noted above; the following are or have been common, although the utilitarian woodcutters have left but few specimens of some of the more useful trees; *Cedrela toona, Taxus, Picea, Pinus excelsa, Quercus floribunda, Q. laxiflora, Staphylea, Dalbergia, Rhamnus purpureus, Parrotia, Viburnum fœtens, Myrsine, Sarcococca Vitis parvifolia,* and *Smilax elegans.*

The predominant herbaceous plants were these; *Podophyllum Emodi, Hypericum speciosum, H. perforatum, Viola Patrinii, Geum urbanum, Fragaria vesca, Trifolium repens, Atylosia sp; a spinous Astragalus, Valeriana Wallichii. Tussilago Farfara, Cichorium Intybus, Serratula pallida, Taraxacum officinale, Inula oblonga, Aplotaxis candicans, Androsace incisa, Teucrium stoloniferum, Nepeta Govaniana, Plantago bauphula, Polygonum bistorta, Convallaria multiflora,* and *C. verticillata:* one of the most abundant grasses was *Imperata Kœnigii* and *Dactylis glomerata* was also frequent.

The few novelties I got were the following; *Euonymus Hamiltonii* not uncommon; *Viburnum stellulatum* rare, *Lonicera alpigena* abundant, *Corylus lacera* rare (this I think is frequent in the Khāgān valley, but as it was not in flower or fruit at the time of my visit I had confused it with an *Ulmus*) *Indigofera atropurpurea* (this also I think I got sparingly in Khāgān;) and *Achillæa millefolium* which was here profuse in some places.

In proceeding towards Rawul Pindee on June 7th, I took the short cut straight down the hill from the station of Murree, thus cutting off a mile or two of the windings of the main road, which is again joined some miles on; and after a walk of 5½ hours arrived at *Chutter* (21 miles from Murree by the road).

which is situated among the low dry outer hills about 5000 feet below the level of the Sanatarium.

The following were the chief plants observed above the half way house at *Tret* which is probably about 3,500 feet above the sea. *Pinus longifolia* (commencing a few hundred feet below Murree) *Populus alba, Pistacia integerrima, Rhus cotinus, Grislea, Sageretia sp: Carissa, Acacia modesta, A. Jacquemonti* and *Clematis montana. Bauhinia variegata* and *Zizyphus Jujuba* both got common on nearing *Tret*; and *Nussiessya* which I had seldom before met except sparingly, was abundant for miles. This last which is in different parts of Huzárá and Khágán called *amrer, chinjer,* and *sandwárí* is the same plant as the *Seharoo* of Gurhwal and Kumaon, and its bark has been recommended as a textile material. A handsome species of *Arundinella* and an *Aristida* were the most noticeable grasses.

After passing the *Tret* bungalow the descent is gradual by a winding road, which for a mile or two is picturesque, but becomes tame and bare. *Dalbergia, Olea* and *Dodonæa* were common, and by streams Nerium odorum was common in full flower.

The novelties of the day were *Sizygium Jambolanum,* which was common, as a small tree for some miles about half-way, and *Solanum verbascifolium,* of which one or two plants occurred near *Chutter* where I staid the night.

On June 8th, I went on to Rawul Pindee about 17 miles. The first 3 or 4 miles from *Chutter,* the road passes through the low, hot, and barren outer hills, where *Acacia modesta, A. Jacquemonti, Carissa, Dodonæa, Zizyphus Jujuba, Adhatoda Vasica* and other ordinary plants of the plains form the chief features in regard to vegetation, while on the plain between these hills and Rawul Pindee, there is a good deal of cultivation, with the common agrarian weeds, which at that season were mostly dried up by the summer heat.

On June 10th, I travelled from Rawul Pindee to Pesháwar by mail cart and some days afterwards received (along with the rest of my baggage) my specimens safe and sound. In regard to them I had been singularly lucky during the whole of my trip, seeing that although they had often been subject to dry accidents, they had never come to great grief in being wetted.

In the 56 days (April 13th to June 8th) from Hassan Abdál to Rawul Pindee I had travelled over some 500 miles, much the greater part of the distance being done on foot, and I collected in all of wild plants about 600 species of *Phænogamous* plants (including 32 grasses and 16 sedges) besides 17 species of Ferns, and several other *Cryptogams.*

A duplicate set of these were sent to Calcutta for Dr. Thomson, in order that they might be compared and correctly named, which he kindly consented to do; and I had the satisfaction of hearing from him that my two months ramble, besides being a source of much instruction, as well as delightful recreation to myself, had done something to elucidate the Flora of an unhacknied and interesting region.

Although at the time I was inclined to chafe at various circumstances which prevented these notes being published soon after the termination of my trip, I now feel there is but little need to regret the delay which has occurred, as experience acquired in the interval has enabled me to make them more complete than I could then have done.

This is hardly the place to enter on the consideration of the timber producing capabilities of the country I passed through, but there is one topic connected with "the development of the resources" on which I may be allowed to say something—I mean Tea cultivation; and this the more especially, although with greater risk to the credit of my own judgment, that a Government experiment in that direction has recently been instituted in Huzárá on a considerable scale.

There are, I conceive, two important obstacles to any great extension of Tea cultivation in that part of the Punjab Himalaya, the first being scarcity of suitable land, and the second, want of sufficient humidity. 1st On this point I of course speak with great diffidence, but I think I may venture to state generally that the district, so far as tea-lands are concerned, is inhabited and cultivated nearly up to its capabilities. This circumstance coupled with the fact of its having been "well preserved" may be sufficient for those who believe that of all the difficulties the tea cultivating colonist in the Himalaya has to encounter, one of the greatest has to be met in parts where there are no suitable waste lands to be got direct from Government, and where the planter has to fight his own battle with the native cultivator armed cap-a-pié for offensive and defensive purposes with his pre-emption and other rights, and his intensely conservative notions.

2nd. From all the information as to tea growing that I have been able to acquire within the last two or three years, and in particular while I acted for Dr. Jameson during part of 1861, when I was necessarily brought into the closest contact with the question, I have been led to conclude that one of the elements essential to the success of the tea-plant is a considerable amount of atmospheric moisture, which involves a considerable rain fall. This perhaps not as affecting flavour and quality, but certainly as to quantity produced per acre, which after all is *the* commercial question the grower has got to look to.

I am not aware that we have yet sufficiently numerous and exact statistics to settle definitely how far the quantity of leaf depends on the average amount of atmospheric moisture during the leaf-producing season, but individually I have no doubt whatever that the causative relation of the latter to the former is a close one.

I regret that I am unable to furnish any direct statistics, to the average humidity of the air in Huzárá as compared with places to the S. E. but in default of these we can form a tolerably correct opinion as to how much drier the atmosphere habitually is in the former from 1st the much greater luxuriance of shrubby and herbaceous vegetation as we proceed S. E. in the Himalaya, and 2nd the comparatively small amount of rain which falls in Huzárá. From what we know of some of the causes influencing the amount of rain-fall and its gradual diminution in proceeding towards the North-west whether in the hills or in the plains, one expects to find the quantity of rain which annually falls in Huzárá to be very much less than that of any district where as yet tea has been successfully cultivated, but the possible difference I anticipated, falls far short of the reality as shewn by such figures as I have been able to obtain.

From particulars of the amount of rain registered at Dehra, Mussoorie, Noorpore, Dhurmsalla and Abbottabad, extending over most of the years 1861 and 1862 (for which I am indebted to the courtesy of various friends and officials) I am enabled to give the following comparative view.

	Mussoorie. 6300. feet.	Dehra. 3200. feet.	Dhurmsalla. 7000. feet.	Noorpore. 1856. feet	Abbottabad. 3800. feet.
Average rain fall in April, September of 1861-2, ...	May to Sept. 122 54	93·2	115·4	64·7	25·13
Average rain fall in October, March of 1861-2, ...		3·53	13·65	3·40	13·47
Average annual, ...		96·73	129·05	68·10	38·60

These figures shew that the rain which falls at Abbottabad in the 6 summer months (and the comparatively large quantity of the 6 winter months is of little or no moment seeing that then the tea-plant is nearly dormant in regard to the production of new leaves), does not in all probability amount to one half of what falls at the same height in either of the two nearest Himalaya valleys to the S. E. where tea has hitherto been grown on the large scale. Abbottabad from its height above the sea and its situation in a tolerably open valley, may in this regard be taken as representing fairly the climate of inner Huzárá; outside the higher hills the case will be still worse, as in such a situation there is not the same protection from the hot dry winds of the arid plains of the upper Punjab.

In so far then as the amount of produce of the tea-plant is affected by the quantity of rain-fall and of atmospheric moisture, the prospective success of Tea-cultivation in Huzara must be considered as doubtful.

I would lay less stress upon the failure which has attended several consecutive attempts even to *grow* the plants in Huzārā, seeing that the officers conducting these experiments, however zealous, had not the advantage of previous experience to guide them, and would themselves probably not be inclined to consider their experiments as crucial. I may mention however that Dr. Buckle informed me that of the few plants he succeeded in raising at Abbottabad in 1856, none had ever (up to 1863), attained a height of more than 12 inches.

I shall conclude this theorizing with the expression of a hope, though not a sanguine one, that the decisive results to be obtained in a few years by the present extensive experiment, may shew that Huzárá will eventually prove yet another district favourable for the growth of the plant whose cultivation must ere many years elapse constitute one of the most lucrative employments of the Anglo-Indian colonist, and supply one of the most important staple exports of this country.

In the progress of my trip in Huzārā I was much indebted to the Deputy Commissioner and his Assistant for frequent and valuable help, as well as to various members of the Abbottabad garrison for the urbanity and kindness I experienced in my visits to that place, and in sundry excursions made with them. To these excursions I still look back with sincere pleasure, tempered only by regret that they were so transitory and are so little likely to be renewed.

I had hoped to be able to add to my Journal some remarks on the general distribution, in the Himalaya and elsewhere, of the plants collected, but these must be reserved for a future occasion.

J. LINDSAY STEWART, *M.D.*

LAHORE:
4th March, 1865.

II.—*Memorandum on the Timber Procurable by the Indus, Swat and Kabul Rivers.*—By H. CLEGHORN, *M. D.*

During my visit to the Trans-Indus territory, I saw considerable stores of deodar and other timber at Attock* and Peshawur, and having an opportunity of conferring with the native merchants, as well as with several officers of the Public Works Department, I collected all the information obtainable regarding the state and prospects of this new and interesting trade, so important both in its commercial and political bearing. I here notice the supply procurable from each of these rivers separately, embodying the replies given by Engineer officers,† who have used the wood in the construction of Public Works at Attock and Peshawur.

Indus river.

There is no record of the timber supplies of the upper Indus, the forests of which are beyond our control or even inspection, but some facts may be gleaned from a Report on the River, by Lieut. Wood, Indian Navy, published in Burnes' Kabul,‡ p. 304; though as regards timber it treats solely of boat building materials and fuel for steamers.

Valley once wooded

The valley of the Indus appears to have been famous for its timber from the days of Alexander to within twenty-two years of the present date. Forests of sissoo existed on either side of the river and on the numerous islands from Torbela to Attock, but "these were wastefully felled during the rule of the Sikhs, and the remaining trees adorning its banks were swept away by the terrible flood of 1841."[*] (Major J. Abbott, in *Jour. As. Soc, Beng.*, xvii., 231). "Indeed the most striking effect of the cataclysm (*Cunningham's Ladak*, p. 135) is the entire absence of trees in the valley of the Shayok, while the lateral valley of Nubra was full of trees upwards of a hundred years old."

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* Generally hauled up on the Khairabad side of the river.

† Major Sandilands, Capt. Pollard, Lieut. Browne, R. E., and Mr. Nugent, Assistant Engineer.

‡ Re-printed from *Jour. As. Soc., Beng.*, x., p. 518.

Fall of river.

From the junction of the Gilgit river to Attock, the course of the Indus is South-west; the distance is about 300 hundred miles and the fall of the river 3,500 feet, or 11.6 feet per mile.[†] This part of the course is little known, but even at Ohind, fifteen miles above Attock, where the river debouches on the Chuch plain, Cunningham (*Ladak*, p. 89) found the current more rapid than that of any other river of the Punjab. From Derbund,[‡] in Hazara, to Acho at the bottom of Astor valley, *i. e.*, for 160 miles, the course of the Indus is quite unknown to Europeans. (Capt. Montgomerie, G. T. S., in Jour. *As. Soc., Beng.*, 1861).

Native traders.

Few natives of the plains proceed beyond Umb, the only persons who can do so with safety are the Shaikzadas of Ziyarat. They bring down deodar logs from the forest in the independent states, upon the upper Indus. The sanctity with which popular superstition invests them as the descendants of a notable saint, is the safegard of their lives and property among the wild Kohistanis, from whom in the first instance they get the wood, and in their passage through the independent Pathan settlements lying between Derbund and the forests.

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[*] Inundation of the Indus, taken from the lips of an eye witness, A. D. 1842, *Jour. As. Soc.*, xvii, 230.

[†] Capt. Henderson makes the mean fall from Nubra valley to Attock, 13⅓ feet, and 21⅓ feet from Attock to Kalabagh. *Jour. As. Soc., Beng.*, xxviii. 207.

[‡] Derbund is an appropriate name—the door is shut.

Derbund.

The timber is floated in single logs as far as Derbund, where it is stopped and a toll of eight annas per log is levied, which presses unequally, as the value of the logs varies much. The late Major Adams tried to persuade the chief of Umb to charge a light *ad valorem* duty. Merchants from Attock and elsewhere, with boatmen of Jehangira, come up to make purchases, and remove the wood in rafts.

Chief of Umb.

The chief of Umb (a minor) has possessions on both banks of the Indus. He is a feudatory of the British Government, but the police and fiscal arrangements are entirely in his own hands. It is his interest to encourage the wood trade as he obtains *mahsul* (seignorage) at a fixed rate. This chief possesses great influence in the upper Indus, and is entitled to toll, but when this has been paid, there should be no detention of the wood : his dues should be well defined and limited.

Independent Pathans.

The independent Pathans of Kabul and Kyab opposite Torbela, also began to levy an impost on all timber that came within their reach, but this was stopped by Major Adams. They received payment for any assistance rendered in floating rafts or launching stranded logs.

Incipient trade capable of extension

Until three or four years ago, very little wood came down the Indus. The wants of the Sind Railway Company first created a market, but the cessation of the demand has dulled the trade, which is capable of great extension. The supply is irregular and depends upon the wants of the hill people, who send large quantities of timber to Derbund when it suits them.

Quality of Indus timber

According to the native dealers and Attock carpenters, the Abba Sein* deodar is the best in quality, being more resinous and durable than the wood brought down the other rivers. Many logs were tested in 1856 by Major Robertson and Capt. Henderson; an abstract of experiments was published in the papers prepared for the use of the Thomason College, No. II., Strength of Materials, Appendix 2.

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* Abba Sein *i. e*, Father river, or main river of the Indus.

Swat river and valley.

The course of the Swat river is imperfectly laid down in our latest maps, the valley through which it flows, though so near our frontier, being almost a *terra incognita;* a description of it will be found in the *Jour. As. Soc., Beng.*, 1862, p. 227, by Captain Raverty, based upon the narrative of an intelligent native of Kandahar, who states that the lower ranges are destitute of trees, but covered with grass. The higher hills on either side are clothed with forests, consisting chiefly of the edible pine and wild olive. The plain also flourishes in cultivated tracts. At the extreme head of the valley near Sardzaey, where there is a pass leading into Kashkar, "there are immense numbers of trees both along the river banks, and on the mountains on either side to their very summits." I am informed by Dr. Bellew, that the dues for large pines are four annas seignorage to the Khan, and four annas for felling and launching.

Principal trees.
Cedrus deodara
Pinus Gerardiana.
Platanus Orientalis
Olea Europea.

Papa Mea.

The first consignment of timber was brought down the Panj Kora bank of this river 8 or 9 years ago, when Col. Nicolson was Deputy-Commissioner of Peshawur, and the trade now appears to be nearly monopolized by Papa Mea, head of the Kakakhel Sayads, described by Major Sandilands of the Peshawur road as "a fair dealing old man, somewhat stubborn and difficult to manage, but frank, and independent." He sells at his own price, rarely at less, fulfils his agreement, and seldom supplies bad material. He lives on his own jaghir, called Walli, near Nowshera, where there is a wood store. His people go where they chose up the three rivers, and those who injure them in any way are threatened with the perils of eternal punishment. Papa Mea, therefore, is the principal man with whom extensive dealings may be carried on. He has a large wood yard at the village of Hashtnagar, near the confluence of the Swat and Kabul rivers, and in British territory. This depot often contains 5,000. logs of various sizes, and he may be said to command the market in its presented limited state. I believe that considerable quantities of deodar may be obtained from the Swat valley, as the forests are said to be extensive, and the river good, if Papa Mea's terms are agreed to, and intimation is given to him six months before.

Scantling.

The great proportion of logs brought down the Swat and Indus rivers are of very short lengths. This arises partly from the local difficulties of transport from the forests to the rivers, and partly from the singular fact, that the natives formerly valued logs, not according to length, but according to thickness, and they are slow in apprehending our object in desiring long scantling.

Lawlessness of Swatis

The following circumstance illustrates the lawlessness of the Swati Afghans. A trader of Peshawur lately felled in the hills above Swat two thousand deodars, which were thrown into the river to be floated down to Peshawur. When the trader entered the Swat territory, the Swatis would not allow the rafts to proceed. The trader complained to the Akhund, who expostulated with them. The people of lower Swat gave up all the timber they had not made use of, but the inhabitants of upper Swat did not, and the logs may now be seen in hundreds on the river's banks.* (*Jour. As. Soc. Bengal*, 1862.)

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* Dr. Bellew has supplied me with the following additional information :—

" Formerly most of the timber came from the hills of Paltau, Palas, Chilas, and Taldardial, all in the Kohistan. Of late, however, this trade has been stopped by order of the Akhund, who decreed that it was better to abstain from a trade that led to quarrelling amongst the faithful whilst infidels alone benefitted. The circumstances mentioned above led to the Akhund denouncing the trade which is now suspended, at least in the hills of Swat. At present, the only timber coming down the Swat river is felled at Tal Patrak, Kabul river.

The vegetation of the valley of the Kabul river was first described by the late Mr. Griffith, who traversed it on his journey to and from Afghanistan. In his Private Journal* and Itinerary Notes, the most characteristic plants observed by him are enumerated. He writes, that the lower ranges of the Sofaid† Koh, (white mountain,) which bounds the valley on the south, are black with firs in some places (p. 414,) and that the course of the Kabul river is rapid, flowing between singularly rounded ranges (p. 422.) Timber is cut in considerable quantities and is floated down in spring to Kabul (p. 390). From Kabul to Jellalabad the river is often fordable, but only useful for irrigation ; below this it affords the means of safe and speedy descent. Towards the lower end of the valley is the direction of the Khyber Pass, no forest whatever is visible, the arborescent vegetation being confined to solitary or scattered trees.

River route from Kabul.

The distance between Jellalabad and Peshawur by the river route is about 90 miles. The current is usually about seven miles an hour.

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a district of Bajawar, under the control of Ghazan Khan of Dir. The river at the foot of the hills is called Malizai Sind, and appears to be either the Panjkora river or a branch of it. It joins the Swat river at Arang Barang, and the united streams are called Sandai The timber is collected in the Malizai and marked by traders, who come down on the rafted timber as far as Main Banda. Below this, the Likandai rapids occur, and the logs must be floated singly. A few miles lower is the ghât of Abazai, where the timber is again rafted and floated to Charsadda, Prang, and Babarra, between which contiguous ghâts is a timber depôt, supplying Nowshera, Akora, and Attock. Timber can only be floated in the summer months. The usual scantling is 20 feet × 10 × 6 inches. The traders take guns, pistols, &c, as douceurs for Ghazan Khan and Akhunzada With care and encouragement the trade may be increased, but the rapids at Likandai are an obstacle to the safe passage of large timber."

* Griffith's Posthumous Papers. Calcutta, 1847.

† The forests on the Sofaid Koh are composed of Deodar, Anunder and chilgozi : the distance from the river is 15—30 miles, but there are no streams fit for floating. Large quantities of bullies and small poles but no heavy beams are brought down. The forests are extensive and the trees large.

This journey is performed in from twelve to fifteen hours, on a raft of twenty-five skins impelled by two large oars. Accidents rarely happen in May, June, and July, when the water is of sufficient depth to cover the rocks, which are dangerous at other seasons. Half way is the large village of Lalpura, on the left bank, where the chief of the Mamund tribe resides. Below are several whirlpools and dangerous places—of these the Shutr gurdun (camel's neck) is particularly dreaded. Tolls are levied on rafts at the village of Michni.

Kuner tributary.

A few miles below Jellalabad, the Kabul river is joined by a broad stream of considerable volume, which drains the Kuner valley, and is likewise practicable for rafts. By this tributary* the best wood comes down to Peshawur. Mr. Griffith, who visited Pushut, the chief town, gives some account of this narrow valley (*Itinerary Notes, p.* 433); "the mountains are well wooded at a certain height, and in greater quantities" than in the valley of the Kabul river; "very different, however, from Hymalayan forests, dotted in parts rather than uniformly clothed with forests." The distribution of the trees is as follows:—the baloot (*Quercus ilex*) ranges from the bed of the river to an elevation of 2,000 feet above it, or 4,500 feet above the sea. Towards its upper limit, it is mixed with "zaitoon," (*Olea Europea,*) which soon supplants the baloot, forming the chief part if not the entire forest, as far as the lower limit of the deodar, 6,500 feet above the sea. "Between this and the summits of the ridges, which attain a height of about 10,000 feet, the deodar reigns supreme, vast in abundance and in size. These forests are available for the timber supply of Jellalabad Peshawur." Griffith regrets that "in consequence of the lawless character of the inhabitants there were no means of access to the beautiful forests visible in several directions." At great personal hazard,* he acquired much valuable information, and it is to be regretted that he was not spared to edit his manuscripts. It would appear that large pine forests lie along the Olipore branch of the Kuner river, which come from the western portion of Kaffiristan, and falls into the Kuner river at Chighar Serai.† Below the pines *baloot* woods occur.

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* The Kaure of Elphinstone. MacGregor calls it Kashkote river, and mentions that grain, iron, &c., are brought down to Jellalabad on rafts of inflated hides. *Jour. As. Soc., Bengal.*, 1842.

Flora of Afghanistan.

From the absence of rain during summer, and the great heat, the vegetation is that of a hot dry country. "On the southern slopes of the Hindu Kush, the great elevation of the chain produces more humidity than elsewhere in Afghanistan; and there is therefore a forest belt, which extends from 5,000 to 10,000 feet. These forests are entirely confined to the mountains which rise out of the valley of Jellalabad, and do not extend further west than the 69th degree of longitude, elsewhere the country is extremely barren, and almost destitude of tree vegetation. The trees are chiefly oaks and pines. There is also a pine forest on the northern slope of the Sofaid Koh range, which bounds the valley of the Kabul river on the south, it being lofty and snowclad almost throughout the year. The pines are *Pinus excelsa* and *Gerardiana*, *Abies Smithiana*, and *Cedrus Deodara*; of those the deodar appears to be the most abundant. In the temperate zone, *Juniperus excelsa* is of the occasional occurrence. The oak of these forests is *Quercus ilex*, a species which extends from the south of Europe as far as Kunawar. With the oak, species *of Æsculus, Olea, Myrtus,* and *Amygdalus* occur."*

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* Mr. Griffith accompanied the army which marched in 1838-39 from Sind, through Quetta and Kandahar to Ghozni and Kabul. From Kabul he crossed the chain of the Hindu Kush to Bamian and Singhau, and spent some time in the Kuner valley. His collections, though formed under circumstances of great difficulty, are very good, amounting probably to about 1,000 species, many of which are deposited in the Royal Herbarium at Kew.

† At Chighar Serai, a transit duty of 10 Rupees per raft is paid to the Ameer of Kabul; at Nurgal, duty is again paid to the Ameer at the rate of 3 Rupees per paddle used on the raft. At the mouth of the river, the rafts are valued and 1/4th. of the estimated value is charged as duty. At Lalpura the chief levies an *ad valorem* duty of 4 per cent, i.e. a raft valued at 1,000 Rupees pays 40 Rupees. At Michnee malliks charge the same amount

Naguman Ghat, near Peshawur.

For some years past all the timber required for the city and cantonment of Peshawur has been brought down the Kabul and Kuner rivers. The timbers are ready squared, often split with wedges, and roughly dressed with an adze, but never sawn, and without special agreement the size does not exceed 24 feet × 5 × 8 inches. Up to 1858, larger scantling was not procurable save by accident. Major Sandilands in visiting the ghât on one occasion, observed a log of unusual dimensions, and inquired if such could be obtained. The native merchant said he was going to Kabul for wood, and would endeavour to procure large timber. He brought down several logs 28 and 30 feet long × 15 × 10 inches. Subsequently some thousand fine logs have been brought down. There is always great delay in procuring such timbers, and sometimes two years have elapsed before they have reached Attock.†

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* Hooker and Thomson's Introduction to Flora Indica. p. 255.

† Dr. Bellew states—"that timber floated down the Kabul river is felled on the Karr Kacha, an offshoot of the Kuner mountain, between Jellalabad and Kabul. Nakhtar, the generic name of pines among the Afghans, of which there are several kinds, is the only wood cut. The mountaineers fell, mark, and convey the timber to the stream below. They then float the timber down in rafts to the Naguman ghat, where they sell the wood to the agents of the Peshawur merchants. There are agents for the purchase of timber at the ghats of Michni, Matta Dauzai, and Khizana. The timber is felled at all seasons, but can only be floated down from the middle of June to the middle of September, when the streams are swollen by the melted snows. Most of the timber brought down is of small size, but a few logs are 2 feet in diameter and 30 feet long. The supply is very uncertain. No Peshawur men can visit the timber districts. Their agents at the several ghats agree with the timber cutters of the Kohistan as to the quantity and dimensions of the timber they are to bring down the next year. Of late years the timber trade on this river has greatly increased. The timber is used in the city and cantonments of Peshawur, and also in boat building. The number of boats built on the Naguman is much greater during the last few years. They are built entirely of Nakh-

Major Sandilands and his assistants have generally dealt with Hindu merchants. They incur dangers and difficulties to which Mahomedans would not be subject and usually disappoint in the tardiness of delivery. They dare not ascend the rivers themselves and employ Pathans, who often treat them badly. A Pathan, Azuf Sha, has offered to procure timber of any scantling within four months, and to give security for punctuality. Large timber is not now required on the Peshawur road, and an opportunity of giving him a trial has not occurred. Papa Mea's tribe are privileged to ascend the rivers but their trading operations are confined to the Swat and Indus rivers.

Native traders.

Both these rivers are practicable for rafts, and if a stimulus be given to this incipient timber trade by the extension of railway and public works, a permanent traffic may be established.

According to the native carpenters, the Indus or Abba Sein timber is the best, being more resinous. The next is the Swat timber which is very good and free from knots. The Kabul river wood often appears to be immature. It splits well, has a few knots but is considered more brittle than the other sorts; some beams have broken straight across and very suddenly. The timber, however, being scarce and expensive has not been subjected to many experiments. Mr. Browne, Executive Engineer, Kohat, states that the deodar received from the Kashgar hills, by the Kuner tributary, is beautifully grown, without knots and splints, equal to the Jelam wood, while he agrees with Major Sandilands that the wood from Jellalabad is not so fine in quality.

Qualities of the timber on the different rivers.

The Indus timber is generally sold at from 4 to 6 annas per

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tar wood, and carry merchandize (chiefly wood) as far as Karachi. The chief impediments to the further increase of the trade are the disturbed state of politics at Kabul, uncontrolable delays, and the faithlessness of the contractors."

Prices of timber.
Indus.

cubic foot. For logs of extra length, 7 to 8 annas is occasionally charged. The average length of the logs is from nine to twelve feet; a few range up to eighteen feet.

Swat.

The Swat river timber was formerly 5 annas: the present arrangements with Papâ Mea is 6 annas 3 pie per cubic foot of picked timber. The logs are short, and usually very thick.

Kabul.

Kabul timber is procurable of any length, according to demand, and varies in price from 5 annas to 1 rupee per cubic foot. The Public Works Department is a principal consumer, as natives do not require long timbers. Traders make sure of the price they are to receive for wood before going up for it.

Scantling of Kabul timber.

The scantlings which have hitherto arrived are—

1st	sort,	50′	×	18″	×	18″	only one log.
2nd	,,	43′	×	18″	×	18″	4 or 5 logs.
3rd	,,	36′	×	18″	×	16″	20 or 30 logs.
4th	,,	30′	×	16″	×	15″	many.
5th	,,	28′	×	16″	×	14″	,,
6th	,,	24′	×	15″	×	11″	,,
7th	,,	24′ to 28′	×	12″	×	9″	,,
8th	,,	24′ to 28′	×	10″	×	7″	,,

Flora of Peshawur.

Almost the only means of becoming acquainted with the vegetaton of the forests round Peshawur is to study the twigs and branches brought for sale as firewood, or as pads for camels. To explore the woods without a guard is dangerous and against regulation. Mr. Griffith was attacked when botanizing in the neighbourhood, and his faithful servant Abdul lost two fingers (*vide* p. 17). Deodar and Chir are brought to Peshawur by the Kabul river, and mulberry, babul, and sissoo are found in the plain; walnut and ash are also obtainable, but only to a small extent. Dr. J. L. Stewart endeavoured to identify the woods used for fuel by means of the bark and the Pushto names, and has published a valuable account of the Flora of the Peshawur valley; of which the following is an abstract:—

Firewood of Peshawur.

"The uncultivated parts of the Peshawur district, are barren in the extreme, there being no forest, and shrubby vegetation is only seen towards the base of the surrounding hills, where small streams occur. This consists of *Acacia modesta*, *Olea Europæa*, *Dodonæa Burmanniana*, and *Reptonia buxifolia*, which grow abundantly as one ascends the hills, while in the dry and barren low ground, the most conspicuous shrubs are *Zizyphus jujuba*, *Adhatoda vasica*, *Capparis aphylla*, *Salvadora*, *Vitex negundo* and *Tecoma undulata*.* All timber of any size is afforded either by the cultivated trees of the valley, such as the mulberry and sissoo, or by the timber rafts brought down the Swat and Kabul rivers, which consist of deodar and other pines. The firewood supply for the cantonment is furnished by the above-named shrubs, and large quantities of oak (*Quercus ilex*) are brought from the Khyber. It appears not unlikely that, ere many years elapse, the supply of firewood for Peshawur at reasonable rates will be difficult."†

Firewood is now sold at Peshawur at about 4 maunds; and charcoal at 2 maunds per rupee.

Waziristan.

The value of the timber of the hills of Waziristan to *us* is very small; if we except the limited supply of firewood afforded by the shrubby vegetation of the outer zone, which is similar to that along the frontier, few of the indigenous shrubs are used and these only in the construction of agricultural implements, and the roofs of small buildings, &c. The oaks of the inner hills are so distant from the plains that their timber is not in request for building purposes; while the labour of conveying pine timbers from Pir Gal would be very great.

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* Less frequently observed are *Celastrus parviflora*, *Celtis*, *Pistacia integerrima*, *Sageretia*, *Grewia oppositifolia*.

† *Jour. As. Soc., Bengal*, 1863, p. 225.

Bara river.

There is no portion of the Trans-border territory so convenient for the supply of timber as that adjacent to the sources of the Bara river, whose numerous tributaries flow from the southern spurs of the Sufeid Koh mountains between Koorum and the Khyber. I learn from Major Lumsden that this elevated region held by the Afreedee and Orukzie tribes, and known as Teera Maidan, has the summit and slopes of its ridges clad with deodar and pine forests, while walnut, plane, horse chesnut, apple, apricot, and other trees are also found below. The intestine feuds of the tribes inhabiting Teera Maidan, have hitherto debarred the development of the resources of these forests, from which short timber could be floated in the season of flood down the Bara stream to Peshawur.

Koorum river.

The valley of the Koorum river, which rises near Huryoob, beyond the ridges of the Solmani mountains, is little known, but is said to contain fine forests. These are mentioned in Elphinstone's Kabul and Bellew's Political Mission to Afghanistan, p. 137. They were also seen by Dr. Stewart in the Waziri expedition. Lt. Browne, Executive Engineer, Kohat, has suggested that timber should be procured fron this source in the same way as Major Sandilands has obtained it from Swat.* The political and economic advantages would be great, but the Koorum is a small river even at its mouth, and it is doubtful if pine logs can be floated down from the hills.

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* Major P. Lumsden, supplies the following information :—There is no reason why timber from Huryoob, Chumkunnie and Koorum itself should not be floated down the Koorum river to Bunnoo, though there are portions of the stream, where except in floods assistance to long timber would be required, owing to its tortuous course. The valley of Koorum and its adjacent tributaries being held in jaghire by Afghan Sirdars, who are poor, arrangments could doubtless be made to cut and float the timber down to our territory; from Thul Billandkhel it must be sent either by land to Kohat or down the stream to Bunnoo.

Kachi forest.

The Kachi sissu forest, of spontaneous growth, extends over 14 or 15 miles on low alluvial land upon the left bank of the Indus, between the villages of Bukkri and Futtykhan, and more sparingly for 15 miles lower down, or altogether 30 miles from Kalabagh. It was mentioned to me by various officers at Mooltan, and it seems very desirable that it should be well conserved, the wood being highly prized for boat building on the Indus, and for railway carriages, &c. From the increase of population and of cattle, the trees are represented as suffering damage, and the forest is said to be gradually diminishing and in danger of extinction. There are few trees in India which so much deserve attention as *Dalbergia sissoo*, the "talo" of the Punjab, considering its rapid growth, the durability of the timber, and its usefulness for many purposes; the wood is universally employed when procurable by Europeans and natives where strength is required. Great efforts have been made to introduce this tree, and where there is depth of subsoil (as in this forest) it grows to a large size.

Sissu and olive forest.

There is a large forest of sissu and olive about ten miles from Kohat, on the Hangu and Meranzai road, which might yield a considerable supply of timber, though not of large size. This, and the Kachi forest* in Bunnoo, are the only sources from whence any great supply of sissu can be obtained in the Punjab. The olive wood (*zaitoon*) is remarkably heavy, sinking in water, the grain is close and the timber useful in engineering works.

Boat building materials.

There are five kinds of boats used between Attock and the sea; those best known are the "zoruk" of the upper Indus, the

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* A small establishment for guarding this forest was sanctioned by the Government of India in 1862.

"dunda" which plies from Mithankote to the sea, and the "dugga" which is specially suited from its strong build to the navigation of the rapids between Attock and Kalabagh. The better kinds of wood used in their construction (sissu and large babul) are procured with difficulty, and various species of timber are generally seen in one boat, such as sissu, babul, deodar, chir, bahn, and karil. Malabar teak is much prized in the lower Indus and fetches a large price.

The ordinary ferry boats are constructed by the sides and bottom being prepared separately and secured by knees or crooked pieces nailed to the bottom and sides. The bottom is made of sissu, the knees of mulberry or olive, and the side planks of deodar. The wedges and trenails are usually made of tut and kahû. Ropes for rafts and boats are prepared either from hemp (*Cannabis Indica*), sirki (*Saccharum spontaneum*), dib, (*Typha latifolia,*) or other reeds, common on the river bank. Munj (*Saccharum munja*) is also largely employed by the native boatmen.

The great boat building localities of the Punjab are Pind Dadun Khan, Wazirabad, and Jelam, but there is a marked increase on the Indus, not only at Attock, but at Nowshera, Hashtnagar, Mokhud, Kalabagh and Esakail. At each of these last six 20—25 new boats are constructed annually. Merchants of Bhawulpore, Multan and the Derâjat purchase them and fill them with cotton, grain and sundries. The "duggas," after dropping down to Sind, are sold, as the cost of towing up against the stream exceeds the value of the boat.

III.—*Memorandum on the Naturalization of Australian Plants in certain Parts of India.*—*By* DR. CLEGHORN.

When proceeding to England, in 1860, I obtained from Mr. McIvor, Superintendent of the Government Gardens, Ootacamund, a series of flowering specimens of the more robust species of Australian *Acacia* and *Eucalyptus* growing in the Garden, and which have been so extensively introduced, as in some measure to alter the scenery of the Neelgherry plateau. The seeds of these large and difficult genera having been received from Melbourne and Sydney, at different times, the nomenclature was naturally, in some cases, perplexing. I submitted these botanical specimens to Dr. J. D. Hooker, Assistant Director at the Royal Gardens, Kew, who compared them with the standard specimens in the Herbarium, and has favored me with the result of his examination.

" Below you will find an accurate list of the Australian plants naturalized on the Neilgherries which you were good enough to bring me."

Albizzia lophantha, Benth.	
Acacia decipens, Br.	
,, *stricta* Wild.	
,, *verticillata, var variifolia.*	
,, *marginata, Br.*	
,, *longifolia,* Wild.	(named *dodoneæfolia.)*
,, *melanoxylon,*	(named *robusta* and *longifolia.*)
,, *dealbata,*	(named *Melanoxylon.*)
,, *pulchella,*	
Eucalyptus " glauca,"	(too young to name.)
,, *pulverulenta,*	(named *perfoliata.)*
,, *amygdalinus,*	(named *pendula.)*

As some of these trees flourish in a remarkable manner, and may become an important addition to our timber trees, not only on the Neilgherry and Putny ranges of Southern India, but as they have succeeded fairly in some parts of the Punjab, from Neilgherry seed, it may be desirable to record Dr. Hooker's list in your proceedings.

JOURNAL

OF THE

Agricultural and Horticultural Society

OF

INDIA.

I.—*A few remarks on Cattle shows and Breeding in India.*

By Dr. DAVID SCOTT, *Bengal Medical Service.*

I SHOULD like to make a few remarks on Mr. Halsey's memorandum, regarding the cattle at the Lucknow Show.

I have not been present at any of the Shows in this Country, and am not aware if there are any distinct rules about the Cattle; but I have seen a good many Shows at home, and amongst them the Highland Society's.

It is, I am afraid, as yet too early in this Country to devide, as at home, the Cattle into the various breeds. But it is very necessary that some distinct principles of breeding and judging should be settled.

And in matters of this kind, the first thing to be settled is, to decide and say, what is wanted.

The objects desired by an English and an Indian farmer, with regard to Cattle, differ entirely.

The former as a rule wishes to produce the largest amount of flesh in the shortest possible time, and consequently, the smaller the bone, and the greater the tendency to fatten, so much more suitable is the animal.

But this does not suit the Indian farmer, who wants size, strength, endurance of labour, and activity in his Bullocks.

If, therefore, Prizes are given with special reference to these qualities, then much more is to be done by careful selection and crossing of the existing native breeds, than by introducing other blood.

And I entirely agree with Mr. Halsey in thinking that the good points of the various native breeds should be defined and settled.

Next with regard to classes of Bulls.

It is usual at Home to divide them according to age, as 1, 2, & 3 years old, also Bulls of any age.

And it is usually worded as follows:—

For the best Bull of such a breed, calved after January 1st 1864, 1863 or 1862.

We could not hope or expect to be able to be exact as to months in this Country, but simply one, two, three years, or any age would be sufficient.

In District Shows at home, it is usual to have a rule, that animals shall either have been bred by the Exhibitor, or have been Bona Fide his property, for a certain time before the show.

Also with regard to Bulls which gain Prizes, that they shall remain in the possession of the Exhibitor for a certain period and that they shall be at the service of the cows of members of the association on payment of a small fee.

In my part of the country the fee I think, was five shillings for each cow.

With regard to Bulls, say of 2 years old, competing with those of greater age.

If any Bull of that age was capable of doing so, by having attained size, shape, and other qualities, it would be greatly in his favour, and consideration would, doubtless, be shown him on that account by the Judges.

And I can speak personally on this subject with regard to a Bull of our own. He was first as a year old in his class, and being put in at the same Show to compete in a class for Bulls of any age he gained the 2nd Prize, there being Bulls of 3 years old and upwards in the class.

He was often shown afterwards, and this was the only time he was not first.

The differance between highly bred and common cattle at home, is quite extraordinary and is observable in all breeds.

Highly bred cattle of the Short Horn, Hereford, Black Polled Angus, Galloway or other Breeds, are as large now, and can be made as fat by the time they are 2 years old, as badly bred ones at almost double the age.

And reaching maturity so early, it is necessary if intended for Breeding purposes, to allow the Heifer to begin at 2 years old, as, if older, they get so fat as to be apt to prove barren, and many of them (when calved late) are not 2 years old when served.

The same remarks apply equally to the Bulls. One great difficulty in their case, being also to keep them low enough in flesh to be efficient as Sires, many becoming useless from fat, when little over 3 years old, even when kept on very short diet.

When at home in 1860 the Highland Society's Show (which is open to all comers) was held at Dumfries and 4 of our cattle of the Black Polled Angus Breed went there.

They were	1 Bull	one year old
	3 Heifers	Do.

They gained 2 First and one 3rd Prize, and though they had not been fed up in any particular way, were as large and in as good condition, as many of the same breed over 2 years old.

What they would have brought if sold, I do not know, but 50 Guineas were offered for the worst of the 3 Heifers, and at a sale of part of the stock in the previous year one year old Bull sold for 81 Guineas and Heifers of the same age for 54 and 55 Guineas.

If any proof of the precocity of these highly bred cattle is necessary, I can give it, in an instance of what occurred on our Farm at Home, as follows.

On an out-farm, which, being a Peninsula was considered particularly safe, the one year old Heifers were sent to graze in the summer.

With these one year, two or three cows suckling Bull calves were sent to graze also.

I do not remember the exact age of the calves but probably one of them must have been calved very early in January and possibly they were all early calves. Owing to the state of the weather they would certainly not be out later than say the middle of October, that is till adout 9 to 10 months old.

There was no other Bull at the place, none could have got there and the Heifers never left it. Yet one of them had a calf the following year, the father of which must have been one of the young Bull calves, then being suckled by his mother.

There was no other possible explanation of the fact and the young Bull must have been about 10 months old, at the most.

In the case of Sheep of the improved Breeds many of them by the time they are 20 months old are so large and fat as to be perfectly ready for the market.

And this applies equally to Pigs, at a far earlier age, many of them being so fat as to be almost unable to stand or see, before they are a year old.

Contrast this, in the case of sheep, with those of this country, which are quite (properly speaking) unfit to put up to feed till they are 3 years old.

Another great difference between the cattle of India and England is that whereas a cow at home has a calf, as a general rule, every year, in this country there is at least 18 months between the calves, and frequently longer.

Even in the case of cows carefully kept and well fed, a calf annually in this country is quite the exception.

If the statistics of the cattle Farm at Hissar were examined I think it would be found that 2 calves in 3 years is above the average for each cow.

I don't understand the restriction to seven years in the age of Cows, having often seen older Cows at Home taking prizes.

If the object wanted is a Bull or Cow best suited to produce work Cattle, then let this point be distinctly stated.

If for other qualities, then let this also be clearly made known.

I am old enough to remember the time when my father always had two pairs of working oxen, and there are still at Home, working oxen in various part of the country.

But no oxen have been bred at Home with special reference to work, for many years, and therefore, for that purpose we must not look there.

The cattle used by my father for work, were usually West Highlanders, and these and common crossbred coarse cattle are now usually in use for that purpose, not only because highly bred cattle are too expensive, but also because in them there is such a dislike to exertion, and such a tendency to fatten, that they are much too indolent to be good workers. In general, oxen are worked for two or three years, and then fattened and sold, and in former years in my part of the country, they and superannuated Bulls often went in the shape of Salt junk in whaling ships to Greenland and Davis Straits.

A good many years ago the Court of Directors sent out some English Bulls to the cattle farm at Hissar, for the purpose of improving the cattle there. When I went to Hurrianah in 1852 they had all been dead sometime, but I saw some of their descendants. What the original importations were I don't know, and only a few of the descendants were alive, several being Brindle in colour. I am inclined to believe that the Bulls could not have been of good breed, for though you do see Brindled Cattle at home, there is no well established good breed; in which it is common, and in most breeds in fact, its occurrence would be sufficient to stamp it with impurity.

Be that as it may there is no doubt whatever that the attempt was an absolute failure, and with the object in view *viz.* the Breeding of cattle for Draught, it is surprising that anything else could have been expected.

For this, the native Breeds are far superior to the English, but if any foreign blood is desirable, then the Cape would probably be the best, or Australian.

For meat producing qualities for this country, the Short Horn is far the best Breed, but its being so, is the very reason why it is not suitable as a beast for Draught.

If, however, the qualities of early maturity, and meat producing, are to be looked for, then there is no breed like the Short Horns.

But whether improvement is to be sought for by selection and crossing of the native breeds, or by the introduction of English blood, attention ought to be paid to the proper principles of breeding, without which the attempts must fail.

I propose making a few remarks on this subject:—

1. It must be understood that any animal for breeding, must be looked at, not only as an individual animal, but as forming or being one of a family or breed.

Therefore, to the axiom of "Like begets like," ought to be added, or "Like the family like belongs to."

2. It is an undoubted fact that the purer the breed the greater the certainty of the progeny following that breed.

And to this must be added, that if two pure breeds come together, the tendency is for the progeny to follow the breed which is most "inbred."

These matters have been carefully investigated at Home with regard to the Race Horse and Greyhound; the pedigrees of these two animals having been strictly kept for many years.

And it is very necessary to bear these facts in mind when trying to improve the breed of Indian Horses, Cattle or Sheep, by the introduction of, say English blood.

However bad the breed of Indian Cattle may be, they are at all events, as a general rule, a pure breed, that is, they have been bred for many generations in the same line, and also are probably much inbred.

And as a general rule the breed is more important than the mere individual; but of this I will give examples by and bye.

In illustration of this part of the subject, I may mention, what happened in trying to improve the Breed of French sheep, by crossing them with English blood, I think Leicester.

The French sheep being of old blood, it was found that it took several crosses of English blood, before the produce had acquired the desired qualities of size, early maturity, and tendency to fatten, and that by the time these qualities had been thus attained, that the produce had inherited so much of the English constitution, as to be unable to stand the French climate.

The next thing done therefore, was to break down the purity of the French Blood, by crossing the various Breeds of French sheep, *with each other.*

This having been done, the crossed Ewes (still entirely of French Blood) were put to English Rams, and the produce at once acquired the desired qualities of size, early maturity and tendency to fatten, whilst at the same time they retained so much of the French constitution, as to thrive perfectly well in the French climate.

In the first attempts, as it took 2 or 3 crosses of English blood to overcome the purity of the French Breed, the produce ultimately were far more English than French. Whereas when the Ewes produced by the crossing of the French Breeds "inter se" were put to the English Rams, the produce were of course still half French in Blood.

It is therefore to be borne in mind that unless you can put to the Indian Cow a Bull of purer breed than herself, the chances are that the progeny will follow the breed of the dam, rather than of the sire.

Take for instance the half-bred Bull Mr. Halsey mentions and going back one generation, put his blood in letters—

Sire. English—E.
Dam, Indian—I. } =E. I.

Then suppose an Indian Cow, whose pedigree would be—

Sire, Indian—I.
Dam Indian—I. } =I I.

Then put E. I., to I. I.; and you will observe that this is simply 3 parts of Indian to one of English blood, with the additional probability that I was more inbred than E.

Take an illustration of this part of the subject of breeding, from Stonhenge on the Greyhound in the case of a Bitch called Perseverance—

Sire, Worcester Marquis,
Dam,—Dressmaker } Perseverance.

Perseverance was put to a Dog called War Eagle, who had one-fourth of Worcestor Marquis' blood also—

The blood of their Progeny was as follows:—

Marquis—3-8
Foremost—2-8
Bugle—2-8
Coquette—1-8

You will observe, that the Marquis' blood is as 3 to 2 in the case of Foremost and Bugle, and 3 to 1 the case of Coquette.

Perseverance had 3 litters to War Eagle, all of which resembled Marquis; (with some peculiarities, which were very observable in the Coquette breed, *viz.*, in the shape of the feet,) not one of the Puppies resembled War Eagle himself, or Foremost or Bugle, because the Marquis blood was as 3 to 2.

Occasionally you observe a Horse or Dog an entire exception to his breed, and however good he himself may be, individually, he cannot be counted on with any certainty as a begetter of stock like himself.

Two examples of this strike me at this moment, *viz.*—Fisherman as a Race Horse, and Barrator a Greyhound.

Take the Dog first—

This Dog was undoubtedly the best Greyhound of his year, and though he had brothers and sisters, they were nothing particular, and he was an exceptional Dog altogether in his breed. He was put to the Stud, and had many first-class Bitches put to him, but he was an utter failure.

The only litter of any note by him was out of Riot, and she, in a number of litters to various Dogs, always threw good Pups.

Fisherman went to Australia at a very large price, and I venture to predict that he will be far less successful as a Stallion than other Horses much inferior to him individually, but of winning blood. At one time many half-bred Stallions, were used at Home, for getting stock, but it proved a failure. No doubt some of them occasionally produced good stock, but there was no certainty in the matter. Because when any cross-bred animal is used for this purpose, what the produce will be is quite a lottery and the greater the amount of crossing, the greater the uncertainty.

There are many cross-bred Cattle at Home, which are first-rate for special purposes. The Short Horn and Angus or Galloway cross is one of the best flesh producing in England, but no Breeder in England would ever think of using a Bull of this breed. The Cows are often used by being crossed again with one of the original breeds, but only for producing stock for feeding purposes.

I believe that the success of Arabs in this Country as Stallions, is due to their purity of breed. An Arab chosen as a Stallion, is generally so chosen on account of his being of High-caste, *i. e.* of pure blood, and therefore, the probability is that his produce will follow him, modified of course by the changes, produced, by different modes of [illegible].

Whereas, if you use a cross-bred English or other Stallion, chosen simply because he is large and strong, in other words, for his individual merits and without reference to his breeding, and put him to a Mare of pure Indian breed, the chances are that the produce will follow her; and if you put him to a cross-bred Mare, the produce may be anything.

And to this is due, I feel convinced, the failure of the cross-bred Stallions at the Studs in this Country: you have the heavy body of the English half-bred, on the thin legs of the Native, if the Mare has been well-bred; or you have a three cornered beast of no particular shape at all, if the Mare was cross-bred also.

Before the Mutiny I knew the Government Cattle Farm at Hissar well, and there the breeding from cross-bred Cattle had been carried to such an extent, that the whole breed had most notoriously degenerated.

They were as a rule, long-legged, narrow, flat-sided beasts, of no substance, and you could see that their breeding was very queer, from the number of letters they had on their rumps. Thus, I have seen this—H. S.—N. G., A. S., or something like it, that is, the sire was a cross of Hurrianah and Scinde, and the Dam had Nagore, Guzerat, Angole and Scinde blood.

In attempting, therefore, to improve the breed of Cattle in this Country, I consider that the first and most important point is to see to the careful selection of the best specimens of pure breeds; and if breeds are to be crossed, I consider it most essential that the cross-bred shall not be used with each other, unless under particular circumstances.

I will put it in this way—

Take for instance a Nagore Bull put to Cows of the Hansie, Scinde, or any other breed.

The proper Sire to use with the cross-bred produce from these, is another pure-bred, Nagore, Scinde or Hansie Bull, according to the kind of stock required.

If you wish to use the cross-bred Bulls, then you must do so in the manner to be explained now—

Thus, take the following example

Sire, Nagore }
Dam, Sçinde } =N. S. Bull.

Sire, Nagore }
Dam, Guzerat } =N. G. Heifer.

If you put the N. S. Bull, to the N. G. Heifer, the produce will, almost to a certainty, follow the N. breed, that blood being 2 to 1. If, on the contrary, you use this sire with pure-bred Cows, the produce will follow the blood of the Cows.

I see a breed called the Nonparah in Oude. Suppose you intend to cross it with the Hansi breed, and to carry the cross further than the first stage, you use a Hansi Bull for the Nonparah Cows, and again a Hansi Bull for the cross-bred produce. But if on the contrary you merely want a change of blood to add some Hansi quality retaining a preponderance of the qualities of the Nonparah breed, then you use a Nonparah Bull with the half-bred Heifer, or use one of the half-bred Hansie and Nonparah Bulls, with pure-bred Nonparah Cows.

In this way you can be pretty sure what the result will be; whereas, if you use cross-bred on both sides, the result must be uncertain, unless there is a decided preponderance of some particular blood.

And another point is this, that it is a great mistake, as a general rule, crossing breeds or animals that are very dissimilar, it being far better to improve by selection of animals, than to attempt to acquire certain qualities, as it were, at a jump.

I hope that I have made clear what the principles of breeding should be. Much more might be said on the subject, and examples could easily have been given of the influence of blood in affecting the produce, but it is not necessary to go into detail.

After the animals are bred, the matter should not end, for though proper breeding is necessary, proper treatment of the produce is equally so. In this Country, no care whatever, as a general rule, is taken of young stock, but they are half starved and allowed to struggle on the best way they can. The contrast in the way of rearing young calves at home and in this country is very great. There they are of great value, and especially if Bulls and intended to be kept as such for breeding purposes, are either allowed to suck their mothers, or are put on to some other cow and are kept sucking till nearly a year old. In the case of common calves merely intended for feeding purposes, they are at once separated from their mothers and are for some weeks fed three times a day on milk warm as drawn from the cows.

After this gruel or something equivalent is added, and they are turned out into a field close by to graze. As they become able to eat more grass and other things, such as ground oilcake, they get milk twice a day and ultimately are simply turned out to graze all day and have some green food given in the house, if brought in during the night.

In this way successive supplies of calves are reared on many farms, (being purchased in the neighbourhood) and at our farm from the milk of 14 or 16 cows, with the assistance of gruel &c. some 40 or 50 calves were reared annually.

Instead of a system like this, in India the calf nominally gets generally the milk from one teat morning and evening, and very little if anything else. When able to wander about, it is allowed to do so picking up what it can get, but having no regular food, and is in fact greatly neglected and starved.

At Hissar each calf I believe sucks its mother and goes out to graze with her as soon as it is able to travel over the ground.

Moreover, as a general rule, with regard to Cattle, Brahminee Bulls are trusted to, and where these are scarce, the Cows get crossed by any young beasts that may chance to be running loose, or the Brahiminee Bull has more Cows than he can manage.

At Home, Bulls intended to be used as sires, are carefully fed from the first, and are now never allowed to wander about the fields with the Cows, but are generally kept shut up in a court-yard, and only allowed to have a certain number of Cows annually, and not allowed to begin before they have reached a certain age.

II.—*On the improvement of the manufacture of Indigo.*

By J. H. GOULDHAWKE.

I do not purpose placing in the hands of the general reader a manual of Indigo planting in all its branches: nor do I pretend to exhaust the subject of manufacture. I would offer some remarks that are I think new to many planters being the result of my own experience and observation. To render these connected and intelligible, I am obliged to say much that is well-known at least to planters.

While those engaged in other branches of manufacture, can supply a given quality for a given purpose, Indigo remains beyond the same controul. The French broker must *select*, from the batches that come to the hammer, such kinds as are required by the Parisien silk dyers: and, though he pays the highest price for it, no one remarking this can say "Very well. I shall manufacture *that* article:" nor can any one guarantee to supply any given quality or color. If further proof is required as to the hap-hazard that attends the process, it is evident in the fact that Indigo concerns turn out, more or less, batches of Indigo from year to year, very similar in their general run of colors.

I use the expression 'general run' to imply, similar sets of first, second and third qualities *peculiar* to each Concern. In such a mark, the practiced broker looks for violet.—In another he feels certain the last chests are heavy hard copper. Whilst the ending of another mark is as certainly "Day and Martins." Nor will change of seasons or change of Managers cause any alteration in these general runs beyond this—that under a careful man the batch will be better. Again for days together we may have fine sunny weather. Steep first rate plant. Have good produce—and, during this period, the whole process from day to day, be identically the same: yet, when the assortment of those days is made, the colors are not alike; and are sometimes very dissimilar. "How can we account for this?" was a question that, many years ago, I set myself to discover an answer to. The conclusion I arrived at will be best understood by the general reader, by my describing the usual process of manufacture; reserving my observations for after consideration.

The plant, being cut and stacked in a vat of masonry, is more or less pressed under beams. Water is then let in, and the whole is allowed to stand for a period varying from 9 to 16 hours. The water at the bottom of the vat becoming yellow or yellow tinged with orange: the surface covered with blue tinted froth, while fermentation seems to have nearly ceased as few air bubbles rise to the surface—these are signs that guide the Rungmistry to assert that the vat is ready. It is then let off into anothor vat, when the mass bears the appearance of a peagreen fluid. A small quantity, held in a tumbler, however, appears yellow. After a certain amount of beating and splashing about, the green fluid turns gradually to a deep blue, by which time the Indigo has become granulated. The beating is stopt, and as the fluid becomes still the fecula is precipitated. I have spoken in very general terms of this process of steeping and beating. They are held by all planters to be most essential: and on the nicest regulation of them, especially the steeping, depends the quality of the color. The impossibility of always obtaining the same color—all the conditions being identically the same,—led me to think that the hitch was not in the steeping or beating, since the eyes and understanding of so many deeply interested parties had been rivetted on them for many years. It must be in some other part of the process that is little noticed: just as a small screw out may spoil the efficient working of a whole machine.

The planter would anxiously see the vats let off and so be sure they are properly steeped. He might remain and see the beating too. After that, feeling satisfied he had done all that was necessary, light his cigar and go home. The Rungmistry too thinks it time he should go to eat. The plug man is left to bring a sample of the water to shew that the whole of the fecula has settled, and receives orders to let off the coffee-colored water that is floating on the blue deposit. The researches of the chemist have been very barren of utility to the planter. It does as little service to know that Indigo is a prussiate of potash; or read in Dr. Ure's works that 24 hours are required for steeping, when every tyro in planting knows better. Still the fault is a chemical one that mars the best steeped and best beaten vat. To make myself understood I must say that the pea-green fluid let off from the steeper into the beater consists of two distinct things if not three. Indigo, sap and green are combined in that fluid. The effect of the beating is to make all three absorb oxygen from the air; thereby the latent Indigo becomes granulated and, being heaviest, settles at the bottom of the vat. The sap and green remain and suspended in the water but the heaviest and thickest portion lies immediately on the Indigo fecula. The draining off of the brown fluid is left entirely to the plugman—a common cooly, whose only qualification is, that he be careful no Indigo runs out. Generally he is too careful, and so keeps a portion of the brown mud to be manufactured along with the Indigo.

It depends then on the accidental proportion of the two ingredients kept together by the plugman, whether one day's color be clearer and better than another day's manufacture—both being *in all other respects* identical in quality of plant, weather and process of manufacture.

This idea having occured to me I tested it by having a common garden watering pot brought and, when the plugman was waiting for a few more gallons of brown water to escape before shutting the plug, I had water gently poured from the rose on the higher end of the vat. The brown fluid was pushed forward to the plug while clear water took its place over the bright blue fecula. With the vats in use, I still found it impossible to separate *all* the offending substance. To effect this I added large quantities of water to the fecula in the boiler, heated it slightly, when, on cooling, the Indigo again was precipitated, and I was glad to find the brown substance was suspended in solution which I again drained off from the boiler. Fresh water was supplied and the whole boiled as usual. The boiler however, was (made like all I have seen) too small for such a process as I wished to carry out. Fortunately I was in charge of a concern belonging to a gentleman who left me to my own judgment in such matters and in fact to be really the Manager—not one whose actions were regulated by strings held in Calcutta. My boiler at the head factory required such extensive repairs that I took the opportunity of rebuilding it according to my own ideas. Retaining the bottom (copper) I furnished Messrs. Jessop & Co. with the dimensions, requesting them to make me sides to suit. I required the slope of the sides to be at an angle of 45 degrees and the perpendicular depth to be 3 feet. These sides were of much thinner copper than the bottom as they would only veneer the walls and be well supported by them. The cubic contents of the boiler were much increased since I gained more than a foot of the plate on every side which before used to be built into the walls. The slope also was greater. I could also scour the sides of my boiler and have it perfectly clean, a great contrast to the brick and mortar plastering that require gentle handling for fear of adding soorkee and lime to the Indigo. Washing the fecula in the vat and heating it again with plenty of clear water in this boiler the whole of that factory's Indigo was of the first quality, yet there were slight differences of color which I hoped further experiments would clear up. However a change of owners was followed by a change of Manager, and I have never since had an opportunity of carying out my experiments. I have mentioned my opinions and experiments to some of my friends and now offer them to the public in the hope that others having the *power* may possess the *will* to make use of the *knowledge* I furnish them with.

Safflower, like Indigo, is not found pure in its natural state. A yellow coloring matter (its sap or blood) accompanies it and dims it. But, while the separation of this extraneous matter has been carefully attended to in the case of safflower—strange to say it has not been thought of with Indigo. Were safflower as *accidentally* separated from its sap as Indigo is, we should have as many shades of that dye in the market. The washing of safflower is however not precarious,—it is carefully attended to. Why should not Indigo fecula be as carefully washed? Again, arrowroot is accompanied by its sap which is of yellowish color, and only when washed out thoroughly with clear water is the arrowroot milk white.

I believe that the manufacture of Indigo has remained in its present primitive state from being considered a *secondary matter* by planters. From my experience of about 30 years I see little change—I may say more; the vats, water-works, in fact every thing, is very much the same as I saw it as a boy.

The plug may be driven into a large Chunar stone instead of into a log of wood built in a vat wall—yet *that* wall remains the same heap of earth called brick and mortar. A splendid brass cock may have taken the place of a common spout and plug at the mouth of the boiler, the boiler still consists of brick and mortar walls with one metal sheet below—probably iron. And these are the rude appliances for manufacturing an article of far greater intrinsic value than sugar. The latter has its vacunm pans &c. &c. because the process was carried on by European minds. We have succeeded to the *native* modes of making Indigo and have left the whole entirely to the *native Rungmistry.* The planter never prides himself as being the *real* manufacturer. When my friend Jones says, "I have made a batch of splendid color this year," I understand him. He means his Bengal Rungmistry has made it for him. This neglect of the manufacturing process is remarkable when we see that Tirhoot used to make such inferior Indigo that it required only a small sugar mania to shut their factories up and convert them into sugar works. The mania over, rungmistries from Bengal became the men—not the planter—to raise the Concerns of that district to their present value.

I think I have said enough on the point to shew the importance of the much neglected manufacturing process, and will conclude this paper with a little advice to the novice. I hope old planters will remember I address only new hands. If you wish to make good color do not steep high as that dissolves the grain of the Indigo, which is then precipitated, *combined* with the brown stuff, thereby giving you more produce but wretched color. With proper steeping we get too much of this brown substance which should be got rid of as explained by me. If in addition to this you do not burn your Indigo in boiling, and in pressing turn out cubical cakes, you stand a fair chance of pleasing purchasers with the neat packing of your chests as well as by the quality of your color.

I have already stated that Indigo was steeped for a period varying from 9 to 16 hours: circumstances determining the point at which the vat should be opened and any further fermentation would spoil the color. This point can be only ascertained by actual experience for no rules can be given in writing when all depends on shades of color difficult to define in words. The appearance of oversteeped vats can be described. The surface of the steeper becomes covered with a mass of blue froth with small spaces presenting a coppery scum on their surface, the water drawn from the bottom of the vat has become of a brownish yellow presenting the appearance of grounds from stale beer. When let off into the beater the froth that forms on the surface of a well steeped vat is white, while in one oversteeped the froth soon is covered with a dirty blue tint. The beating having commenced first gently gradually increases in force as the fluid becomes blue by which time the froth of a well steeped vat begins to disappear, the water acquires a very perceptible degree of warmth and by the time it is quite ready the froth that forms has no substance and the bubbles forming it immediately burst, this I term the vanishing froth. It shews that all the vegetable substances of indigo sap and gum are set free and will precipitate if allowed to stand The beating should be stopt. The warmth that the vat has acquired seems to generate steam, and gives out an exhalation very perceptible to the smell There is not a vestige of the smell of green or acid matter left, while diminutive globules are thrown up from the surface to the height of 3 or 4 inches. Of course the indigo has granulated. In an oversteeped vat, the froth in the beater increases as the beating goes on instead of subsiding. The man who has called himself a Rungmistry and let off the vat now sprinkles oil on the froth to make it settle. The surface of the vat is covered with a greasy, dirty scum, the beating cannot be carried to the same point The grains of indigo floating in the water are very fine. For fear of rendering them soluble and incapable of being precipitated without the addition of some alkali, the beating is stopt.

As my previous remarks were intended to point out the necessity of separating the brown coloring matter from the Indigo in the beater and again when put into the boiler, I shall say no more on that point. The boiling however requires greater care than is usually given to it. The fecula should be subjected to a regular continuous heat till the surface clears a good deal of the blue froth that first forms in boiling. Cold water should be then dashed over the surface and the boiler let off into the table. Prevention is better than cure; so great care should be taken to prevent dirty and extraneous substances of every kind getting into the Indigo, since it is not so easy to get them out again. Sand especially is often so fine that it is perceived only when the cake is perfectly dry and being broken and held in the sun the particles sparkle.

A reservoir is consequently a very useful thing. Muddy-water, resting for 9 hours in the steeper deposits its mud on the Indigo, and much that would injure the color is so held back; but all the water added to the fecula in the beater when being taken up into the boiler or added to that on the boiler, should be perfectly clear.

In pressing the Indigo before cutting it into cakes, care should be taken not to allow it to remain soft, the other extreme should also be avoided of rendering the slab so brittle and hard that no wire will cut it. If the cakes retain a nice cubical shape when dry it is all that is required.

The drying houses (or godowns rather to which the word drying is scarcely applicable) now require some remarks. These buildings are generally dark damp places swarming with bats above and toads below, so that one feels aguish on entering, and anything but pleased with the odour caused by the bats. As if this state of things was not bad enough I have known in many places the planter take further precaution to render them dark and damp. If the walls have windows of open lattic brick work, the spaces are carefully closed. The cakes cannot dry by the time that the cold weather sets in, when the dry west wind passing through them causes to crack in every direction. The remaining moisture is too rapidly taken out and the planter hears the click of cake after cake as it cracks while he walks up the damp and dirty godown to see if he can begin dusting his cakes preparatory to packing. It never strikes him that the cakes he has kept in his room exposed to light and air, have dried and that without cracking. He imagines there must have been some fault in the manufacturing when all that he wanted was an airy clean drying house. I built one having these properties on the site of such a damp dismal place as I have described and found my cakes to remain entire, while previously, cracked cakes were the rule. It stands to reason that if, during the rains, the easterly wind has free access to the cakes, they will dry slowly and thoroughly; no moisture will be left in them by the time the cold weather sets in with its westerly dry atmosphere.

The floor of the Godown should be filled in with sand, on which a layer of *jhama* (over burnt bricks) should be put down, and then lime and coarse soorkee be beaten down and smoothed, not so neatly as in a dwelling house yet sufficiently strong as to bear sweeping. I accidentally discovered a plan of keeping bats out of the Godown. To protect the beams and burgahs of the roof I had boiled them in tar water. The smell of the tar prevented a single bat from ever flying into the house. This is a hint that may be followed with advantage, though I believe light and ventilation had something to do with keeping the bats out.

Note by Mr. W. U. Eddis.

I have read through Mr. Gouldhawkes paper on the manufacture of indigo. His remarks regarding the indigo grain, and other substances in the water, are doubtless correct, but do not, I think, convey any new information. In beating vats, fecula reservoirs and boilers, provision is made for the careful draining off of the refuse water. It might possibly be more effectually done, but Mr. G. makes no practical suggestion of improvement in the mode of building. The use of the watering pot, which he recommends, is common. I do not think that the difference of color depends specially on "the accidental proportion of the two ingredients (sap and gum) kept together by the plugman," because the plugholes in the beating vat are all fixtures, and the plug man as a rule drains off the water exactly to a certain depth. A high wind, or rain falling may lengthen the process, or cause somewhat more water to be carried away with the fecula, which in that case is drained off from the fecula reservoir or boiler. No doubt properly draining off the refuse water is a most important part of the process, but if it is done in the same manner and precisely to the same extent, day after day for a month, some of the indigo made being pure and fine in color, and part dull and heavy, it is clear I think that the difference is attributable to other causes. No attention to draining off the water, for instance, will make good indigo from rain injured, or inundated, or stale plant. Mr. G. certainly says that the process being "*in all other respects identical as to quality of plant, weather, and process of manufacturing,*" the indigo made with attention to complete removal of the refuse water will be the best. This is true but no more so than that the process in all other respects being identical, including the careful removal of this water, the indigo from a properly steeped vat will be the best. The fact is that every part of the process must be carefully watched. Attention to the manufacture of good indigo must commence with the choice of lands, and end with the careful assortment of colors and packing of the cakes.

III.—*Particulars respecting the growth of Cotton in the Amherst District.—Communicated By Col.* A. P. PHAYRE, *Chief Commisioner of British Burmah.*

[The following information regarding Cotton exported from Moulmain has been derived from information afforded by Lieutenant Colonel D. Brown Deputy Commissioner of the district of Amherst.]

The cotton exported from this district is chiefly grown on the banks of the Salween from Wen-Kyan up to Shoay goon. Its quality is admitted to be superior to any other cotton produced in Burmah. The deposit of silt, mixed with very fine sand, forms a rich light loam which appears peculiarly well suited for cotton. The deposit is considerable every year. This arises from the silt being brought down from above, by the great incline of the bed of the river. Below Shoay Goon the incline is not so great, the current is consequently less rapid and the water, during the rains, unable to find an exit towards the sea by the main channel, especially when it is kept back by hightides in the South West Monsoon, overflows its banks and leaves behind it a rich deposit. Above Shoay Goon where the incline is considerable, and below Wen-Kyan where the channels are wider, and there is less overflow, also from a greater portion of the silt having been dropped higher up, these localities do not present the same facilities for growing cotton as that between Shoay Goon and Wen-Kyan, a distance of about 30 miles. Cotton is grown in small quantities on the Gyne, Thoungyeen and Attaran rivers for home consumption. I have not been able to ascertain that any purchases for exportation have been made of cotton grown on those rivers, nor of that grown in Thoungyas (hill plantations) by Karens living among the hills to the eastward of the district. The cotton on the Salween is grown by the Talines, Shans, Karens and Thoungthoos living there.

2. The cotton is bonâ fide indigenous, that is, it is of

the variety usually grown in this Province. As far as can be learned no foreign seed has been imported since our possession of the country so as to affect the quality of cotton as an annual plant.

3. It is sown in September or October and gathered in March and April. The produce per acre is from 200 to 300 Viss of uncleaned cotton. It is cleaned by the ordinary Burmese Gin; from 100 Viss of uncleaned, 30 to 35 Viss of cleaned cotton are obtained. One Viss contains 3. 65 ℔ avoirdupois. The average yield per acre may be stated to be 100 ℔ avoirdupois. The land yielding cotton pays a yearly rent of Rs. 1-4-0 per acre to Government. A reduction of this rate would not probably increase the cultivation.

4. With a contract law wisely framed, so as to protect the interests of capitalists, and their servants; with new rules for grants of waste lands to be given on far more liberal terms than they are at present, I see no reason why, with the advantage of good soil and suitable climate, cotton and other products should not be raised in this Province with equal facility and with profit as elsewhere.

Waste land on the Salween River can be now purchased at the upset price of Rs. 2 and 3 per acre.

5. It is believed that 5,00 to 10,000 acres of suitable land might be procured in addition to that now occupied. But the good land is scattered over a wide area.

6. The area of land on both banks of the Salween producing cotton in the season of 1864-65, amounts to about one thousand acres, in addition to which, a considerable quantity of land contains cotton plants mixed with other products. This last amounts to 1,400 acres. If we estimate that one half contains cotton plants, that will make a total of 1,700 acres of land under cotton cultivation on the Salween rivers. We can hardly estimate the produce as greater than 100 ℔. of clean cotton per acre, which gives a total of only 170,000 ℔s raised in the district.

IV.—*Growth of Poppy from Untapped Seed.*

(Communicated by the Board of Revenue).

In July 1861, the Private Secretary of the then Lieut. Governor, the Hon'ble Sir J. P. Grant, forwarded to the Board for their opinion a letter addressed to him by Captain J. F. Pogson in which that Officer detailed the results of his experiments in the cultivation of the white Poppy in the Himalayas in October 1860.

Captain Pogson whose chief object it would appear was the introduction of the Hill seed in the Opium Agencies, assumed a deterioration in the Bengal seed to which he attributed "the failure (more or less) of the Bengal "(Benares and Behar) Opium Crops," and urged the introduction in both Agencies of "fresh Poppy seed from Simla." Captain Pogson at the same time forwarded a packet of the Simla Seed through the Secretary to the Agri.-Horticultural Society.*

The Board forwarded Captain Pogson's letter to Government with their No. 350 dated 22d July 1861 (retg. copy) and sent copies to both Agents for report with an intimation that the Board had "suggested to Government that a trial of Hill "seed may be made in both Agencies and the produce put "up in a chest of a different appearance from the ordinary "provision and sent to China as an experiment."

In their letter to the Government above quoted the Board observed that although as a rule a plant deteriorates if raised for a series of years on the same ground from its own seed, the deterioration of the Poppy or its produce had not been matter of complaint from the Agencies, nor had it been urged that the yield of Opium was less than it used to be, nor were there complaints in China of the Opium drug being inferior to what it was; and added that on the contrary the consistence of the drug as delivered by the Assamees was very high that year.

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* Captain Pogson's letter is published in vol. XII page 46 of the Proceedings of the Society, and subsequent papers at page 413 of the same volume. Eds.

The Board also pointed out that if fresh seed were required, the best seed would probably be got from Smyrna; that though Turkey Opium was considered the finest produced, superior quality was not so much an object, as the maintenance of the distinctive character of the provision Opium; and that it was advisable on many accounts to abstain from trying experiments, as the introduction of a new plant might affect the flower of the drug in a manner scarcely to be detected by the non-consumer, but likely to raise the suspicions of the Chinese who are easily alarmed by even a change in the packing or covering of the chests.

The Board recommended a trial in both Agencies with Hill seed, the produce being sent to China as an experiment in a chest of a different appearance.

About a fortinght *prior* to the receipt in this office of Captain Pogson's letter, the then Junior Member of the Board, Mr. A. R. Young, in a note directed the issue of a letter to both Agents calling for early report on the following points:

1. What arrangements were usually made for the supply of Poppy seed to the districts of each Agency.

2. Whether the seed of any one district was supposed to be superior to that of other districts.

3. Whether any interchange of seed took place between different districts, or between districts of the two Agencies.

4. Whether such interchange of seed had been, or was likely to be attended with advantage.

The Behar Agent in his No. 92, dated 10 July 1861, replied —"that there was no systematic interference in his Agency "with the cultivators in their choice of seed, but that on "their request and on advice of the Sub-deputy Agent every "facility is afforded for the purchase and transmission of "seed from one district to another, all expenses being paid "by the cultivators requiring the seed—though they would not "be held responsible in the event of loss during transit. "Generally, cultivators prefer the seed of their own immediate neighbourhood and the Agent does not think it advisable to interfere with their arrangements otherwise than "by assistance, such as above described, fully accorded."

The Benares Agent replied (No. 77 dated 26 July) by means of extracts "from the replies of the several Sub-Deputies"—to the effect that the cultivators generally supplied themselves with seed without resort to the Deputy, and it was assumed (doubtless correctly) that cultivators naturally mistrusted all other seed. On some occasions, (1858-59) for instance when owing to the mutiny sufficient seed could not be gathered in Benares, seed had been imported from Patna and distributed among the cultivators. Mr. Wilson, Benares Sub-Deputy, writes that the Patna seed had good effect as he believes, but he stops there. Mr. Osborne from Gorruckpore, says that in 1838 when he first joined that Sub-Division, he introduced Patna seed amongst the growers "with advantage, "but the particulars were lost with the other records during the mutiny."

Mr. Turnbull—*Cawnpore.* Upon joining the Sub-Division he pointed out to cultivators that instead of sowing "the "seed they obtained from their Poppy over and over again in "the same lands" as they were in the habit of doing, it would be very beneficial to them if they would change "their seed "yearly with their neighbours in other villages." This advice was followed by some. The other Sub-Deputies write much in the same strain. All are of opinion that an interchange of seed would be beneficial; but then there is the mistrust of the cultivator who knows the freshness and good quality of his seed and is not sure that that which is obtained from his neighbour will germinate. Mr. Armstrong of the Ghazeepore Sub-Division adds—"under such circumstances it seems hardly possible to introduce a measure of "the nature contemplated by the Board, because Assamees "are limited to time and opportunity for sowing their fields, "and if they were to trust to foreign seed though it might be "gratuitously tendered to them, and it should fail, the consequences and loss might be attributed to, and fall upon, "Government." He adds "if a supply of the Bhagowtee seed, "carefully collected and preserved, say of about 4 or 500 "maunds, and which is notoriously good in the Behar Province, could be forwarded to him," he would get it all sown and would watch and report the result. This result does not seem to have been ever reported.

To both these letters, Board (No. 389 dated 9 Aug. 1861). replied to the effect that it would be advisable to collect about 100 maunds of the best seed procurable in the Agncies and exchange with each other, "for sale at cost price to any "Assamee who may wish to try the experiment of a change." And Benares Agent was asked to report "whether the capsules "preserved for seed are tapped or allowed to remain untapped"—to which he replied (para. 4. No. 90 dated 15 Aug. 61) that the seed, used by the cultivators, is invariably taken "from the tapped capsules." In reply to the first part of Board's letter, the Agent proposed to defer the purchase of seed until the following season, as good seed was not procurable then. Board consented and sent copy to Behar Agent.

In the mean time Government. replied to Board's report, in their letter No. 374 (A) of 7 Aug. 1861, entirely agreeing with the Board.

In Nov. following (vide Board to Agents No. 605 dated 19 Nov. 61.) the Board forwarded a packet, to each Agent, of Poppy seeds obtained from plant grown on the Neilgherries for experiment.

In July 1862, the Behar Agent (No. 131) reported that Mr. Field, Sub-Deputy, obtained from 2 beegahs of well prepared garden-land, 7 maunds of seed at a cost of Rs. 133. 11, the seed being genuine and from untapped capsules and the produce of the finest land. Mr. Bean, another Sub-Deputy, from his 2 beegahs, 8 maunds and 36 seers. "The "seed was paid for, in both instances, at the rate of 10 seers "per beegah, that being the yield of immediately adjoining fields."

In addition to these 15 manunds and 36 seers of seed from untapped capsules, the Agent received from the Financial Commissioner of the Punjab, 1 maund and 36 seers of best and freshest Kangra seed at a cost of Rs. 46. 9. 6. All this seed was distributed amongst 3 Sub-Deputies to be sown by each in 6 beegahs of land under their immediate eye.

More seed appears to have been subequently produced, and a larger extent of land put under culitivation. The results of the sowings in the Behar Agency are given in a statement annexed to Agent's letter No. 212, dated 4 November 1863. This statement shews that in the 11 Sub-Divisions, 178 Beegahs of land were cultivated experimently—yielding maunds 24. 9. 6. from untapped seed against maunds 31. 32. 11 from tapped seed. The whole report may be summed up as being in favor of the tapped seed.

The results of the experiments tried in the Benares Agency are reported in the Agent's letter No. 138 dated 5 Aug 1863, the statement accompanying exhibiting that in 9 Sub-divisions the quantity of land cultivated experimentally amounted to B. 81. 9. 5. yielding Mds. 12. 3. 1¼. from untapped seed. This gives an average yield of about 6 seers per beegah, against an average yield from the adjoining fields of about 7 seers per beegah from *tapped* seed.

It is remarkable however that in a very large number of villages the average produce from untapped seed exceeded that from tapped seed. This excess in produce, in either case, may be attributed to local circumstances such as soil, climate &c. It can hardly be said, reasonably, to be the result of either description of seed.

The Board in reply to Benares Agent (No. 449 dated

27. August 1863) observed that the experiment was not conclusive in its results. The object of the experiment, which was "to determine whether the use, year after year, of the "seed of the untapped capsule causes the plant *in any way* "to deteriorate," has not been established. "In some places "the untapped seed has given much better produce, and it "might answer to introduce the change of seed accordingly." And the Agent was requested to try again in 1863-64, "as another experiment could best test this fact."

No seed from the untapped capsules having been kept by the cultivators, the experiment could not be repeated in 1863-64, but the Agent added (No F. dated 5 September 1863) that he did not believe that even if "the experiment was to "prove successful, which however would seem to be some-"what doubtful, Opium cultivators would be induced to "have recourse to this seed, being so thoroughly wedded to "their own seed and to that belonging to cultivators who "exchange with them in the neighbouring villages."

The results of this second experiment in 64-65 are reported in Agent's letter No. 74 dated 10 October 1865. They are well summed up by Agent in his 3d. para:—"Notwithstanding "that the experiment this year had been tried with the "greatest care under express and elaborate instructions issu-"ed by my predecessor (Mr. Hamilton) in his Cir. No. 75 "dated 1 October 1863, I am afraid that the results are no "more conclusive than they were in the trial of 1862-63."

The statement accompanying this report shews that in 10 Sub-Divisions, 86½ beegahs of lands were cultivated, yielding maunds 15 6 1¾ from untapped seed. This gives an average yield per beegah of seven seers, against an average from the adjoining fields from seed from the tapped capsules, of 6⅝ seers per beegah. The total yield on this occasion is slightly in favour of the untapped seed, but in a large number of cases the produce in the adjoining fields (from tapped seed) was far greater, and no doubt those increases and decreases, from the same description of seed, tend to render the results of the experiment quite unsatisfactory. Indeed it would be difficult, if not impossible, to say to what cause any increase over the produce in an adjoining land should be attributed, seeing that while one land sown with seed from the untapped capsule (in the same village) produces a quantity in excess of that yielded by the adjoining field sown with tapped seed, the next plot of land sown with the former produced less, compared with the produce of the land adjoining.

The conclusion therefore to which the Agent has arrived, and very correctly, it would appear, is that "the produce "from the plant obtained from the seed of the untapped "capsule is not so much greater than that obtained from the "seed of the tapped capsule as to render it worth while to "introduce it generally and that the continual use of seed "from the tapped capsule does not as a rule tend to cause a "deterioration in the plant."

V.—*A few remarks on the mode in which Tea cultivation can be successfully conducted in the Himalayan range.*

By M[illegible] G. HATHORN, *Royal Artillery.*

been adopt.

ically prevails l be admitted, that it is of the highest importance to India that a right understanding of the true principles on which tea cultivation can be successfully carried on in the Himalayan range, should generally prevail; and, as it appears to me, that those principles have been hitherto entirely lost sight of, or perhaps never known at all, I venture to lay before the Society a brief statement of my views on the subject; hoping, that, by so doing, I may be useful to others.

In the first place, then, I think, that due enquiry will shew, that tea-planting on the present single plant system, throughout the Himalayas, is a complete failure. For instance, (and I quote at random the first instances that occur to me), the Hawulbagh and Ayar Tali plantations in Kumaon produced last season 44 lbs. an acre; Kowlaghir in Dehra Dhoon., 66 lbs. an acre; the Hope Town Tea Association Darjeeling Hills, 29 lbs. an acre; and the Aloobaree plantation Darjeeling Hills, 36 lbs. an acre. Now, in places where tea-planting pays, as for instance, Assam and Java, the out-turn, on an average, amounts to 280 lbs. an acre; and instances are mentioned where even 560 lbs. have been produced. The Himalayan plantations, whose out-turn I have quoted above, are all of upwards of eight years standing. I contend therefore, that the present Himalayan plantations are a complete failure. The reason for their being so, I shall now proceed to discuss.

Tea has been cultivated throughout a large portion of the vast empire of China for about 1,200 years; in the island of Java for about 35 years; and in the small province of India, called Assam, for about 30 years. Now the point to which I specially wish to invite attention is, that in initiating this new culture into the Himalayas, whose climate for the most part resembles those portions of China and [illegible]ya in which chiefly tea is cultivated, and is entirely dissi[illegible] [illegible]om that of Assam, the Assam system of culture ha[illegible] [illegible]ed; instead of that other system which univ[illegible] in China and Java, and by which as large returns are obtained there, as by the other system, in the totally different climate of Assam. In Assam, Cachar, and other hot localities, the tea-tree is planted *singly*, because the heat there causes the plant to grow fast, with a stem of young brown wood, and conduces to prolific leaf-bearing. Nothing more is required. But, in colder regions, tea, so planted, grows slowly; becomes woody in the stem; and, as leaves are, according to botanists, "a flattened expansion of the fibres of the stem," they partake of the nature of that stem, and become hard, and brittle, and unfit for tea-manufacture. The yield of leaf is also much smaller, because produced more slowly. Consequently throughout China, and in Java, tea is invariably planted in *bushes of five or six plants in a bush*, and the centre of these bushes at 4′ × 4′, or 4′ × 3′, or 4′ × 2½′, according to the soil; the closer planting being adopted in the poorer soils. (This prevents woodiness of stem, and affords the necessary quantum of leaf. It may also be added, that, though the Assam plant is said to be of the same species as the China, it certainly is a different variety. The Assam plant partakes of the nature of a tree, whilst the China one is always a shrub.) Taking all this into consideration, it seems to me perfectly unaccountable that we should have attempted to cultivate the China Tea-plant in the Himalayas after the fashion of the Assam tea-tree in the plains of India, and have not even given a trial to the mode of cultivating it universally adopted in China and Java, and which in the former country has been arrived at, after a practical experience of twelve centuries!!! This mistake I believe to be the chief, of not the only, cause of the entire failure which has attended tea-planting in the Himalayas; and I beg the Society, if it agrees with me, will, as early as practicable, invite public attention to it. I have sent a pamphlet to press, with especial reference to the tea cultivation of this district; and it will, I hope, be published within a month. But as the Society's special object is the improvement of the Agriculture and Horticulture of the whole of India, I take this opportunity of bringing the subject to its notice, as a point which affects not only Darjeeling, but tea-planting throughout the mountains of all India.

In the pamphlet on the tea cultivation of these hills, to which the Society lately awarded a premium of 500 Rs., the system of planting in poor soil single plants at 6′, × 5′, was insisted on. This would place in each acre 1452 *plants*. Another gentleman considers 8′, × 8′, the correct distance. This would give 680 *plants* only to each acre. The system which I advocate places 18150 *plants* in each acre. Can any one doubt which would produce the greatest quantity of leaf?

It has been objected to "the bush system" that the soil could not adequately support so many plants. To this I would reply, that, the very same soil, a few years ago, supported a primæval forest of gigantic trees, and yet we are expected to believe that it is incapable of nourishing bushes of the tea-plant four feet in height planted at four feet by four? Moreover it now supports a dense impervious jungle of bushes, eight or ten feet high, wherever it is not incessantly kept clean. Why then should it not support our little tea bushes? Besides, the system does answer throughout the whole of the Mountains on which tea has for ages been cultivated. Why should it not answer here?

There is a cry now raised that tea-planting in these hills does not pay. Of course it does not; nor would any other cultivation in any part of the world pay, if foolishly carried on. The tea-plant here is perfectly healthy. The mistake has been, (and I regret to observe that it is made in almost every Number of the Society's Journal) applying Assam and Cachar experience to the tea cultivation of these and other Indian Mountain ranges; and referring for opinion questions, regarding the cultivation of the China tea bush in cool localities, to gentlemen whose chief experience is confined to the cultivation of the Assam or Hybrid tea tree, in the tropical heat of Assam.

Some planters advocate the introduction of the Hybrid plant into these plantations. I am of opinion it would be a mistake of the same nature. Plants of Assam derivation do not answer in cold places. They might, possibly, be grown in the bottoms of our valleys, and the lower end of our slopes; but for general use in our plantations, they would be inferior to bushes of the China plant of which, it is said, there are 200 varieties, (a few of which may be worthless, but) the greater number of which are eminently suited for cultivation in these hills.

I beg specially to invite attention to—

"Ball on the cultivation of tea in China, Chap. 4."

"Jackson's Handbook for tea cultivation in Java, Chap. 8."

"Fortunes Tea Countries of China, Vol. 2; Chap. 14."

"Penny Cyclopædia of 1842, article "Thea." "

all of which entirely bear out what I say.

I think it very possible, that Mr. McIvors theory of cutting off the tap root of the tea plant * might answer in these hills, where the good soil is not generally very deep, although it is objected in the deeper soil of Assam or Cachar. This, and a thousand other instances might be quoted, showing how utterly worthless it is to apply Assam or Cachar experience (even as regards the cultivation of the China tea plant) to the cultivation of these hills. It has been the sole cause of every mistake that has been made; and has wasted in this district alone more than 70 lakhs of rupees.

The problem to be solved is not "how to produce the greatest number of fine specimens of the tea plant within an acre," but "how to produce the greatest quantity of succulent tea-leaf within an acre" A little reflection will shew that these problems are not identical, and cannot be solved in the same way. Planters at present in these hills (especially the gentlemen who advocates 8′ × 8′) are attempting to solve the first. I trust this letter will go far to solve the second.

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* See Society's Journals lately.

HOPE TOWN, DARJEELING DISTRICT:
February 23rd, 1866.

THE GARDENER'S NOTE BOOK—No. 7.

VI.—*Culture of Asparagus: communicated by* C. E. BLECHYNDEN, ESQ.

Select a piece of ground that has a good proportion of sand in it. Trench, trenches to be 2 feet deep and 2 feet apart. At the bottom of each trench lay a layer of old dung manure 4 inches in thickness, over this put about 2 or 3 inches of earth taken from the trenches. Raise your seedlings in September, and when about 6 inches high place them at the bottom of the trenches 2 feet apart; as they grow shovel in earth, till the plants come to the surface; let them form a bush when you may commence drawing the young shoots for use: at each time of opening the bushes put in a handful of vegetable mould before closing up. After three month's use cut the bushes down to the ground, then weed and let the young shoots grow up again. When the bush is large enough commence using the young shoots again. In this way you may have three good crops in the year. During the heavy rains let the plants have rest: but just before their breaking up, cut the plants down once more and thus ensure a cold weather crop of Asparagus. Do not raise the earth round the roots above the level of the ground but keep the land well drained. During the hot weather, and when the plants are young and not out of the trenches, irrigate when requisite.

VII.—*Memorandum on the preparation of certain Fibres.*

By JOHN STALKARTT, ESQ.

The first thing to be considered in the preparation of certain fibres, commonly classed under the designation of Hemp, is the time they should be cut; in some hemp it is advantageous to cut just when it is in flower, before the seed pod begins to form, and some when the seed is half ripe, and other plants when the seed is quite ripe, this of course will depend upon experience; that which is done in other countries is no rule for this but only assists in guiding our opinion. Experience must teach us. I believe that the Sunn Hemp *(Crotalaria juncea)* should be cut when in flower; the Jubbulpore *(Crotalaria tenuifolia)* when the seed is formed or nearly ripe, and the Duncha *(Œschynomene cannabina,)* when it is quite ripe; it is then that the fibre has its greatest strength. It is necessary that hemp should have three qualities, strength, softness or suppleness, so as to bear a twist, a good twist, and to be clean in the fibre, that is well separated,—no bark adhering to it, no root ends. If the hemp is cut and exposed to the sun before steeping, the bark adheres to the fibre, and is very difficult to separate, but it should be tied into bundles of the size of a large birch-broom, put into water in heaps, of fifty or hundred bundles; they should then be placed in such a manner that when fermentation takes place the fermentation should be equal throughout the heap. The fermentation takes place so rapidly in this country, that the hemp is very often ready in twelve hours, eighteen hours, and some times, though rarely, as long as three days, according to heat of weather. In Russia it takes from nine days to three weeks. Seeing bubbles in the bundles is a sign that it is sufficiently fermented or rotted. Take a stalk and attempt to break the stout end of the hemp with the hand, if the wood leaves the fibre it is sufficiently steeped. The hemp should be very carefully watched, one hour's too long steeping will ruin it. When ready the bundles should be taken out of the water, stacked, dried and crushed at leisure. The same water should not be used again for steeping the hemp, or the putridity of the old batch enters into the new batch, destroys its strength and its colour; a running stream for that reason is preferable to tanks. The reeds or stalks, when perfectly dry, should be crushed or broken, either by fluted rollers or by a machine which I here transcribe from a French work; from its readiness of construction and portability, I think it peculiarly adapted for this country.

This instrument is of wood and of very simple construction; it is composed 1st. of a piece of wood from four to five feet long, eight inches broad and a little less in thickness, raised on four feet 30 inches high. It has two grooves nearly its whole length and (its whole thickness) two inches wide.

2nd. Another piece of wood of the same length, but only six inches in breadth and a little less in thickness, grooved in its whole thickness and in nearly the greater part of its length, with one groove two inches in breadth so as to fit exactly in the first piece of wood, one end of it to be rounded as a handle, the other fixed by an iron pin to the upper part of the grooves of the first piece of wood like a pair of jaws. It is sufficient to see hemp crushed once to understand the whole of the mechanism; the man or woman that crushes takes in his or her left hand a handful of hemp, and with the right the upper jaw of the crushing machine, they drag the hemp by degrees between the two jaws, by raising and letting it fall repeatedly, with a certain force they break the reed under the hemp that surrounds it;—in dragging after this manner the hemp between the two machines the broken and pulverized reed is forced from the hemp, and a coarse gum or bark falls off like bran and a finer gum flies into dust; when half the hemp is thus crushed, they turn it round and commence upon the other half. The hemp is laid upon the ground till there are two pounds, this is folded in two and slightly twisted. In crushing it by fluted rollers, it should be passed through several times till the reed is well crushed, a man then takes it by the hand in the middle and beats all the pieces of reed out of the hemp with a stick, a process they call scutching it. This is sometimes done by blunt swords or by a scutching machine. There is no doubt that the hemp is *strongest when the seed is ripe,* but then a very requisite quality is often lost, that of suppleness, and the hemp though able to stand a steady pull is sometimes harsh and brittle; for we ropemakers to make a good rope have to pull it and twist it at the same time. This is said to make the strongest hemp. Another way is not to steep it at all but cut dry, crush, and scutch the hemp as above mentioned. A third way is to strip the fibre, bark and all from the reed, when the seed is ripe, and then to steep this raw fibre in water a certain time, then rub and wash it, something like the washermen do, to clear it of the bark and extraneous matter. Notice also in what soil your hemp is grown; in stiff clayey dark soil it is very difficult, I believe, to clean the fibre from the vegetable matter. In sandy soils, that is half sand, half the fibre in general is easily cleaned from the bark and vegetable matter surrounding it.

JOURNAL

OF THE

Agricultural and Horticultural Society

OF

INDIA.

I.—*Agriculture in India. By* DR. DAVID SCOTT, *Bengal Medical Service.*

IN one of his answers to the Manchester or other cotton associations Lord Canning said "That the Ryots in India had very little to learn in the way of cultivation."

Whether he meant merely with regard to cotton or agriculture generally, matters not, for it seems to me impossible to imagine a greater fallacy in either case, and it is much to be regretted that it has gone forth with the sanction of his name.

There are, no doubt, many places in India where the soil is well and carefully cultivated; but it is quite the exception, nine-tenths of the land being neither half worked nor cleansed, and starved besides.

We hear constantly a great outcry about over assessment, oppressions of the Ryots &c. &c. Will I be considered as holding very queer views if I say that it is all a delusion. We may consider the Land Tax as being equivalent to Rent, that is for all practical purposes, and I assert that low Rents never yet made good Farmers, though it has made (and ruined) many bad ones.

Of the bad effects of low Rents on Farming, there could be no better example than the old system of "Life Renters" on the estate of the present Lord Dalhousie in his father Lord Panmure's time. Within my recollection there were numbers of these in our county, and not one of them that I ever heard of did any good, on the contrary almost every one failed to live by his farm, though the Rents were merely nominal.

A relative of my own had one of these Life-rents, and though after leaving his Farm, he proved to be a first rate man of business, a worse Farmer it would have been difficult to find. Ultimately a new Tenant was got who paid the Rent to the Landlord (about 2/6 per acre I think) gave the Life renter £250 a year and did well himself.

On another very large Farm where the Life renter had been bankrupt two or three times, his successor declared he could pay the whole of the old rent from the crop of a single field, and there were plenty like this.

(There was a good story told of this Liferenter. At a meeting of his creditors on one occasion, they proposed to take the management of his affairs and make him an allowance. He remonstrated against the smallness of the sum proposed, saying "Dear me Gentlemen, how do you expect me to go on at the old rate with that money.")

(These Life rents were very often rewards for services at election and would now a days probably come under the head of "Bribery and Corruption.")

The great essential difference of course between England and India in the way of Agriculture, is water, the object at home being generally to get rid of it, in India to get it, freely and under control.

Without water of course no crop will grow, but in the mode of working the soil, in rotation of crops, change and selection of seed, manuring &c. Indian Farming is generally in a miserable state.

First for working the soil. How is it possible to expect crops to grow well, with such wretched ploughing as we see in India. The soil is not moved to a greater depth than two inches in general, and that only just when the seed is about to be sown; and instead of being ploughed up to a good depth *after* the crop is off the ground and left exposed to the atmosphere, there is a bare baked surface untouched, till it is time to sow again.

The surface scratching (for it is nothing more) not only gives little fresh soil for the roots to pass down into, but by being so shallow, allows much of the rain to run off the surface.

If the soil was ploughed to a greater depth the roots would go deeper, and much of the rain which now merely falls and is lost, would be retained in the loosened soil.

Of the proof of this nothing is more simple than to try an experiment in the beginning of the rains by sowing say convolvulus. Dig a few patches of various depths and see which requires least artificial watering. You will find that as you increase the depth of digging, so much less water will be required, and the reason is plain *viz.*, that the loosened soil allows the rain to penetrate and is retained, whereas if it falls on hard baked ground a large proportion runs off and is lost. And the benefit continues after the crop is growing, because with increased water at the roots there is more rapid growth, the crop covers the ground sooner and the evaporation from future showers is greatly diminished.

When the crops are entirely dependent on the rains, it would of course be almost impossible with the present means at the Ryot's command, to plough up the ground *after* they are cut, as by that time the rains are over and the soil very hard.

But certainly much might be done where they are grown by means of irrigation.

And it would well repay the cultivator, to flood his lands *after* the crop is cut, simply to enable him to break it up and expose it to the atmosphere, whilst laying fallow.

This breaking up acts beneficially in 3 ways.

1*st.* By exposing the soil to the air.

2*nd.* By bringing fresh soil into play, the surface being turned down.

3*rd.* By exposing and thus killing the roots of many weeds.

I suppose it is needless to say that the Indian plough is a wretched article and equally so to add that in general a Ryot thinks if he has given his bullocks just as much food as keeps them alive, he has done all that is necessary. The wretched plough and starved cattle, necessarily result in the ploughing we see and its natural consequences.

English ploughs would of course be out of the question and yet a modification of them suited to bullock draught, would give far better work with the same bullocks, than the present native plough, and we can hardly hope to see steam ploughs in India to any good purpose until we have English landlords, with capital to set them agoing.

Nothing I suppose would convince a native that by feeding his bullocks well, he would be amply repaid by their increased ability to work, yet the farmer at home who starves his horses, is very soon looked upon as being a very bad manager.

Unless an animal is properly fed and cared for, it cannot be expected to work properly, and it is most false economy to try to save money, by starving either man or beast that has work to do.

There are no harder worked horses in England now-a-days probably than Omnibus horses, and they are amply and carefully fed and cared for.

The best fed bullocks I have seen in India, were in the Peshawar valley some years ago. Work cattle in general of course are meant and not exceptional cases.

There are two reasons why cattle in the Peshawar valley should be well fed. One was the great cheapness of grain (I have known barley selling at 5 Peshawar maunds for a rupee in the Euzufzae) and the second, that doubtless the owners had found out, that ill fed cattle would not stand the cold of the climate.

Setting aside the inability of ill fed bullocks to work properly, there is another very serious result follows from their low condition.

This is their liability to disease. And the mortality which takes place amongst these cattle when a famine or epidemic comes on is very great. The worse the condition so much the less chance is there of the bullock escaping.

Much more might be written on this subject but it is unnecessary.

Next with regard to the rotation of crops.

This is a point almost totally neglected in India, although with reference to the general want of manuring of the soil, it is a most important one.

Year after year the same process is gone through and the same seed sown in the same soil, which must naturally become exhausted and weakened by such a process.

At home where, even with all their endeavours by means of various manures suited to resupply the soil with what the crops have been taking from them, it is not customary to grow the same crop in the same place oftener than once in five or seven years, that is according to whether there is a 5 or 7 years rotation of crops. Whereas in India there is not only in general, no change in the kind of crop, but no attempt to correct that fault by manure.

As for a change of seed I fancy if ever such a thing takes place in India, it must be quite unintentional and the result of accident, brought about most probably by the Ryot having sold every particle of what he had grown, and then having been obliged to buy or borrow seed at sowing time.

Yet none of our cultivated grains at home can be sown continuously in the same soil without deterioration.

Generally speaking a farmer at home finds it advantageous to get a change of seed every few years, either by bringing it from somewhere else, or if he has different soils on his farm, by growing alternately in the various soils.

Of the grains grown in England wheat requires change of seed more frequently than any other, next oats and lastly barley. This last I have heard a good farmer say may be grown for years together on the same farm without change, but the opinion is not general.

Change of seed in potatoes is also very important, whilst with regard to turnips, as hardly any Farmers grow their own seed, it may be said to be changed every year.

With regard to this country as far as regards European food, we may confine ourselves to the single grain, Wheat.

In the part of the country I know best at home, wheat is grown pretty extensively and is sold at so much per quarter, according to its weight per bushel, and the same with barley and oats.

Or to explain more fully; take a time some few years ago. There is a fixed weight per bushel which is understood when grain is sold.

Wheat say was to be 62 pounds per bushel, barley 52, and oats 40.

For every pound per bushel above 62, wheat rises in price eighteen pence per quarter, and barley and oats a shilling.

Say wheat was at the rate of 50 shillings per quarter (the 62 pounds being understood) if it weighed 63 it was 51-6, if 61, 48-6, and the other grains in the same way.

To most people a quarter of wheat is just a quarter of wheat, but you will observe that its weight is of great importance and not only so, as a matter of price, but especially in quality.

It may be taken as a general rule that the higher the weight the better the quality, and one of the great drawbacks in light wheat is, that it will not work well by itself. That is, it makes bread of such inferior colour, that bakers cannot run the risk of attempting to work it by itself, and accordingly only a certain proportion of light wheat is used to mix with that of better quality.

I do not know what weight per bushel wheat may be in this country but should guess that generally it is a good deal below even 60 pounds.

One of the reasons for inferior quality and colour of wheat at home is want of sun, and this of course does not apply to this country.

And as grain in this country is sold by actual weight and not by measure, it may be supposed to be of less consequence. Still the difference between light and heavy grain in quality is so great generally, that any improvement in that respect would be a great boon.

In writing on such matters it is difficult to avoid entering into personal details; let me therefore be excused if I give an illustration drawn from our Farm at home.

This contained two kinds of soil suitable for wheat. One stiff clay well drained, and the other black soil much more free and situated on higher ground.

It was invariably the custom to saw the low clay ground with seed grown on the black soil and vice versa. Yet even with this in the course of not more than six or seven years, great deterioration had taken place.

The grain had not only as a general rule lost two or three pounds per bushel, but had lost also in quantity, color and other good qualities, and it was absolutely necessary to get an entire change of seed from a different prrt of the country.

Yet this land had been carefully worked, cleaned and manured and the best of the wheat selected annually for seed.

If we want to see careful "Farming" we may just look at market gardening, near London. There by means of the most careful working, cleaning, and most ample manuring, the same crops are grown year after year, not perhaps always in the same place, but far oftener than can be done over a whole country.

But the Farmer of India seems to think that he may go on taking from the soil and never giving.

Next with regard to manuring.

I fancy that almost the only crops in India that may be said to be manured *generally* are sugarcane and tobacco.

It is true that near most cities and villages and round about wells, some small amount of the land is manured, but it is quite the exception, and taking the country generally it may be said that nothing of the kind is done.

But even when manure is applied it is most generally rendered worthless by the way it is treated. First it lays spread out about the village and is left for months exposed to the sun, and then when it has been carried to the land it is to be used for, it is not at once ploughed in, but left in heaps on the ground till half its value or more has been lost.

Even at home where the sun is not nearly so powerful, much damage is done to manure by exposure to sun and rain, so much so, that it is very common to have a coating of earth put over the manure heaps to prevent this.

The sooner manure is ploughed in after being put on the land so much the better, and I remember very well in the Lothians, on one occasion when looking on at the planting of potatoes, my friend the Farmer mentioned that he insisted always on only so much manure being spread as could be at once covered and that he would not allow it to be left exposed even for the hour the work people went to their dinner.

No doubt much of what would be manure at home, in this country is consumed as fuel, but far more of it is actually wasted and thrown away.

Take any of our cantonments for instance. In England this would be a source of income to the place, and would pay for keeping it clean, whereas in this country it costs government large sums yearly, simply to clear it away and throw it down in some waste spot of ground.

As for its being put to any use in the way of manure such a thing is never thought of, and even the litter of our own stables (except what may be taken away to feed milch buffaloes on) is troublesome to be got rid of, instead of being as at home a thing that sells most readily.

In fact it may be said that the only use this is put to, is to burn in brick kilns, to the loss of manure for the crops and the poisoning of the whole neighbourhood with the smell thereof.

It must always be understood that these remarks are merely general. I am perfectly well aware that there is some rotation of crops in India, manuring of soils &c., but it is to a very limited extent and generally only with reference to some special crop such as Sugarcane or Cotton.

Speaking of the latter there is one point which I have not observed paid attention to in the various hints and directions regarding its cultivation, and that is the importance of sowing it in drills and not broadcast as is invariably the Native custom.

I believe myself that the best plan of sowing cotton, would be in raised ridges, in the same way as Potatoes and Turnips at home.

The advantages of drill sowing are, in the first place the plant can be sown far more regularly than by broadcast, and with less expenditure of seed, also that blanks can be easily filled up, whilst it is far more easily kept clean and much of the hand labour saved, by passing the plough up and down between the drills, the same as is done at home with Potatoes and Turnips.

It is quite true that the cheapness of labour in this country renders this of perhaps less importance than at home, still the rapidity and efficiency with which the work is done mechanically, is a very great advantage.

I have often been surprised that no means have been taken to introduce mechanical aid to clean grain in this country, for the matter is most simple and the machine could be made all over the country where there is any man capable of making a Thermantidote.

Most of the thrashing machines at home now, clean the grain and separate the heavy from the light, but even the old cleaning apparatus which was driven by one man or woman and fed by another and which was nothing more than a Thermantidote with a sifting apparatus, would be an immense saving of time and labour.

Wherever Government has a bakery for European Troops, one of the small new kind of these machines, would be a saving in expense as they would clean the wheat far better than the five and twenty old women who now do it. If one was got out from home as a pattern they could be made from it. They are not at all complicated and if there is any difficulty it would probably be in getting the wire netting for sifting and this could easily be procured from home if it could not be made here.

Most of this paper was written more than 3 years ago and since then Government Bakeries with apparatus for cleaning the wheat have been and are being built in various stations, nevertheless there is no reason for changing what has been said and simple "Fanners" introduced into this country would be of immense advantage.

For only just note the amount of labour wasted and the time the grain is exposed to rain and dust in the open air by the present method.

First it is thrashed by means of bullocks, then the bulk of the straw is removed in the shape of chaff, and after this and waiting for a suitable day, the grain is cleaned as well as it can be, by being thrown up into the air.

But this I need hardly say acts in a most imperfect manner, as merely the remaining chaff is removed, all such things as small stones, and mud falling down with the grain.

I am quite sure that from one cause or another I have seen grain laying out constantly for ten days or a fortnight exposed without protection to whatever weather there might happen to be at the time.

Whereas with a single set of Fanners the whole grain of an ordinary village could be done in some 3 or 4 days and infinitely better done too; employing at most 3 or 4 men or women.

The sifting apparatus can be made to suit any kind of grain, and as the machines are small enough to be portable, they might be moved from village to village and any settler would find it of great advantage to introduce them on his estate.

I have not the least doubt that with merely a working plan or a small model, "Fanners" as they are called in Scotland, could be turned out at Roorkie with perfect ease.

It is an unfortunate matter that Government cannot undertake any thing almost without having to pay at least double what private parties have, otherwise I feel sure the establishment of model Farms in various parts of the country would be of immense advantage, example in the way of better crops being far more telling, than any amount of mere talking and lecturing.

Established within reach of one of our large cantonments the manure which must be removed from about the Barracks and Lines could be used and made the means of producing vegetables for the use of the Troops.

Unfortunately here also expense is the stumbling block at the very first step.

You cannot do such a thing without good European superintendence and adding the cost of that to the price of cabbages, would prove I fear much too expensive.

Much hereafter no doubt may be expected from European settlers in various parts of India, but at the same time it is necessary to bear in mind, that most of those who settle in India, know nothing whatever of farming, so begin their apprenticeship late in life and with no one to teach them what is wanted.

People dont intuitively know farming any more than they do law—still most men imagine that they can farm and very often pay well for their self confidence.

Supplementary Remarks.

This paper does not pretend to be any thing more than the merest sketch and the remarks are entirely general, but there are certain principles in agriculture which are always applicable; and proper ploughing, manuring and cleaning of land, with rotation of crops, change and selection of seed, are just as necessary in and good for India as England.

And there is one more point which ought to have been noticed, and that is that for a pretty large portion of the year the cultivator in India does nothing whatever that has any relation to the soil he cultivates, whereas at home the cultivation or some thing connected with it, goes on the whole year.

I have said nothing either regarding what is in India a great curse *viz.*, that thousands of men have a small patch of land not half enough to employ them constantly, and yet sufficient excuse for them to do nothing else.

I believe I should have said millions instead of thousands, and so much the worse, for every man in this position is not only half idle himself but keeps some other half employed man the same, there being ample work for both almost any where close by now.

I have not meddled with this point became it is a matter political as it were, but it is, as stated, one of the greatest curses of the country.

There have been various proposals for the establishment of Agricultural Colleges, Model Farms &c., but they have invariably halted at the first step *viz.*, the expense.

If ever Government should commence one or other or both of these Establishments, let them bear in mind that they must not look for any great results immediately, and moreover that in all matters pertaining more specially to improvements in breeding nothing can be more fatal to success than change of system and management, and that whenever they select a Manager or Superintendant he ought to be a man who has most of his Indian life before him.

But as an introduction to something more regular and extensive in this matter, it has always appeared to me that

Government had at its command a means of showing an improved system of Agriculture, without going to any great expenditure of money *viz.*, in the cultivation of the lands attached to the various Studs.

If I am correct in supposing that there is great room for improvement on the native system of farming; it would cost Government little to have the experiment tried there.

It would be a very small item to introduce improved ploughs, harrows and other agricultural implements, and the other improvements, in ploughing, manuring &c., could equally at the same time be carried on there.

But, as stated already, men are no more born Farmers than they are Lawyers, and training in the one case is just as necessary as the other, and even a trained Farmer must acquire experience as to the soil, climate &c., of the locality, before he can be sure of the best way of cultivating it.

Before concluding there are two points I wish to note with regard to Agricultural Shows in this country.

1st. When prizes are given for the best samples of grains, the competition should be strictly limited to the actual producers of the same.

At home corn merchants are strictly shut out from these prizes, which should be given only to actual growers.

What benefit for instance can possibly result from some Bunneah exhibiting the grain he has just purchased?

2nd. In Scotland it is common to give prizes for the best growing crops of Turnips, and it appears to me that this might do very well if extended with regard to Cotton in this country, as prizes might be given in various localities and committees appointed to decide as to the merits of the crops. When a competitor enters his name to compete for one of these prizes he ought to give the size of his farm, the number of acres under that crop, with the kind of soil and method of cultivation.

And the amount of Acres for competition, must bear some proportion to the size of his Farm, *i. e.*, the Farmer say with 500 acres must exhibit double the amount of one whose Farm is only 250.

The examination takes place by means of a committee whilst the crop is growing, and they particularly notice the state of the land as to its being clear and carefully cultivated.

When the crop has been cut or stored the winners send in a careful statement as to the soil, manuring, mode of cultivation (*i. e.*, how often it was worked, cleaned and the expense thereof) with a statement of the produce per acre, and this is published for the information of the members and public.

Now the same system might very well be introduced here with cotton or sugar-cane and it appears to me that it would be especially beneficial if introduced as it were locally in each collectorate, always bearing in mind that the 5 beegahs of a small Zemindar if well cultivated, are as deserving as the 50 of a large one.

II.—*On the Improvement of the Manufacture of Indigo.*

(No. 2.) *By* J. H. GOULDHAWKE.

In my last article on this subject, after making some general remarks on the unsatisfactory state of the manufacturing process, I proceeded to select for investigation the cause of difference in color, in dates when equally good plant, in equally good weather, is carefully steeped and beaten in identically the same manner. By the use of such terms I thought I had excluded all consideration of "rain-injured, inundated or stale plant," also all difference of color resulting from difference in the quality of plant or period of steeping. I find, however, I have been misunderstood. I again desire the reader to confine his attention to good plant properly steeped and beaten in good weather. I assert that these equally favourable circumstances may last for a weak—yet those seven dates of color will not be the same. No shower of rain or storm has come on to "cause somewhat more water to be carried away with the fecula." The plugholes being fixtures in the beating vats, "the plugman as a rule drains off the water exactly to the same depth"—yet—the colors of those seven days differ. I have been told that the plugholes being fixtures and the plugman always leaving the same depth of fluid in the beating vat, is a conclusive argument against me; and the difference is, consequently, attributable to other causes than the different proportions of brown sediment with Indigo fecula. A little consideration will however shew a different result.

The plugholes in the beating vat being fixtures, I will take four inches as representing the depth of the fluid left in the vat after the lowest of the plugs for drawing off the refuse water has been removed. If the steeping vat contained 100 bundles of plant when stacked one day, and gave a sediment of *only* fecula 4 inches deep there could be no brown sediment left with the fecula. If on the next day 75 bundles are steeped—quality of plant, steeping, weather &c., being identically the same, we have as good produce; but from there being ¼ less plant, we have ¼ less fecula or 3 inches of Indigo fecula, when, the plughole being a fixture, the remaining ¼ is *one inch of brown sediment.*

It is true that the fecula reservoir and boiler have generally plugholes. These are used when a high wind or rain falling, makes it necessary to take up a large body of water. They are never used when the volume of fecula is of the *usual quantity*—no matter what that fecula may consist of. The difference in the color of the two days manufacture is clearly owing to the difference in the proportions of the two substances manufactured together.

It is impossible to stack *alike* any two days—not only from the hurried manner the coolies stack; but one day's plant will have more stalk in it: another day more leaf, although the quality of the plant of both dates be the same. With such causes of difference always in operation, it is impossible that a fixed plughole could remove refuse water thoroughly. If to this be added the carelessness of the plugman, and, that in the anxiety of the coolies to get the fecula out of the vat, it is too often the case that all that a fixed plughole *could* remove, is not drained off.

I think I may say without fear of contradiction, that no great pains are taken to see that as little as possible of the brown sediment is taken up with the Indigo fecula—simply because sufficient importance has not been attached to this part of the process. In laying so much *stress as I do on the necessity of separating the brown sediment from the Indigo fecula,* I little expected to be understood as teaching some new process by which good Indigo might be made from rain-injured, inundated or stale plant. My object is to save good dye from being spoilt by a prevailing oversight. That my views are new regarding this separation is evident from the fact that the buildings or vats in use being all built on one and the same principle, are incapable of effecting it.

The fixed plughole is universal, and I have shewn it cannot carry off a liquid that varies in depth. The admission made by Mr. Eddis that a more perfect separation is possible, at once concedes the point I am endeavouring to bring prominently forward—that this part of the process has not held the important position it ought. And why? Because its necessity has not been perceived from want of correct views as to the nature of the whole process.

Mr. Eddis in his note on my last paper remarked that the use of the watering pot was common. If it was used merely to prevent the edges of fecula in the beating vat, becoming dry as they were left exposed by the receding of the refuse water, it was not the use to which I put it—to propel the upper refuse fluid to the plughole, by flushing the vat with clear water—not merely moistening the edges of the fecula. There is a vast difference between these two uses of the same instrument.

I would now make some remarks on the nature of rain-injured, inundated and stale plant. In all these a fermentation has already taken place. No chemical test is required to support this assertion since the very smell, acid or putrid as the case may be, is a strong indication, yet unheeded, for such plant is again subjected to fermentation, and the result is, frothy vats that give a wretched dye that does not pay its own manufacture, besides spoiling good plant that is generally stacked along with it! If I am asked what do I do with such plant? I reply, "exactly what my neighbours do." "But why" is the rejoinder, "since you know it is wrong?" I answer "simply because the vats and works in use *and custom* leave me no alternative."

I have heard planters speak highly of their new vats, as yielding splendid produce "What fine oily vats they are!" The cause of the rejoicing is nothing more than that the fermentation in such vats has produced a more complete combination between the blue and brown sediments, that no subsequent process can separate. Should my remarks be considered as conveying nothing new—all suggestions for improvement are valueless. If on the other hand my strictures on the present mode of manufacture are allowed to convey new and valuable information, I shall return to a subject of no small importance, considering the amount of capital held in circulation by the manufacture of Indigo.

III.—*Note on the Japan Silkworm.—By Captain* THOMAS HUTTON.

MY DEAR SIR,—The eggs of the Japanese Silkworm which you were kind enough to send me in February last arrived here, at Mussooree, on the 2nd of March, and were just beginning to hatch. This process, as I previously told you, went on very irregularly for many days, showing that the worms were not in a healthy state.

When first hatched the worms had the head and prolegs shining jet black, the anterior segment ashy white, and the rest of the body as usual covered with small tufts of short hair of a pale brown. After the second moult the worm had a good deal of the appearance of the little China monthly worm *(B. Sinensis.)* known in Bengal as the "Seena, Sina or Cheena;" the markings and smallness of the worm being in some instances quite those of that species, while others of the same age appeared much larger and very much resembled the worms of *B. Mori.* or *B. textor*, being of a sickly white with the usual semilunar spots on the back. Like the worms of *B. Sinensis* however they grew very slowly until the last stage, when the increase in size was rapid and the worms bore all the appearance of a Boro-pooloo, or a dwarf *B. Moori* being at maturity about 2½ inches long, which is the size to which *B. textor* attains at Mussooree.

For a long time I was sorely puzzled to make out what the worm could be, for the variety in the marking of different individuals was so great, and so often changing at the time of moulting, that I began to think the worm must be distinct from any known species, until suddenly the mists of doubt were entirely dispelled by the appearance of a *black* worm in all respects identical with those of my reverted *B. Mori.* From that moment I began to see my way, and when at length on the 2nd of May just 26 days after hatching, the worms began to spin their cocoons, it was perfectly evident that the worm, about which the French have gone mad, and the silk-cultivating world has made such a fuss, is nothing more than a *Hybrid*, or cross between the true sickly *B. Mori* and the little monthly *B. Sinensis* or "*Seena*"!

The proof of this is conclusive, and I send you cocoons to show that I am not guided by theory or preconceived notions, but by hard indisputable facts.

According to the labels attached to the wooden tubes in which the eggs arrived, one hatch should have produced "*white*" cocoons, and the other "*green*"—yet both have spun them of the same size and shape, and *all are of a pale sulphur yellow*, except that of the solitary black worm which is decidedly as to size and colour an undersized specimen of *B. Mori* of Cashmere and China. I send this cocoon along with a few of the yellow ones, as an offering to the Horticultural Society, in whose Museum the proof of the correctness of my remarks may thus be preserved, and made available to all who may wish to see how easy it is for cunning rogues like the Chinese to gull the too eager and confiding searcher for new species, by crossing different species so as to produce *Univoltine*, *Bivoltine*, and *Polyvoltine* varieties.*

The moths, which came out on the 19th May are miniatures of the pale unhealthy specimens of *B. Mori*, being ashy white with a faint transverse brown line on the upper wing.

I have preserved some of the eggs wherewith to carry on my observations, and ascertain whether eventually the cross will wear out as in other instances, and the worms revert to the annual *B. Mori*. Further than this I do not consider the worm worth cultivating as the uncrossed races from which it is derived are to the full as good or even better in every respect, for the *B. Mori.* can only be deteriorated by such a cross.

I have long known these cocoons, having received specimens both from Mr. Moore of the E. I. Museum and from M. Guérin Meneville with a request to mention to what species they belonged; I decided that they were the produce of *B.*

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* At the bottom of the box are cocoons from eggs marked "*Green*" together with the cocoon of B. Mori which stamps the cross.

At the top is a cocoon of the Cashmere worm of last year, put in for comparison, and the others are from Japan eggs marked "*White*"; among them since I last wrote, one white cocoon appeared which I send, and regard it as corroborating my view that white shows weakness in as much as this is the last cocoon of the batch when the time for spinning had exceeded the proper number of days.

Sinensis but without any idea then that the worm had been crossed. In the colour and size of these cocoons we recognise the influence of the small polyvoltine *B. Sinensis*, and in the shape and texture the influence of *Bombyx Mori.*

As to the univoltine, or polyvoltine character of the worms, all will depend upon climate, and the degree of influence exercised over individual worms or moths, by the species from which they spring, and no purchaser of eggs in Japan, China or elsewhere can ever be certain that he has secured a batch of either univoltine, bivoltine or polyvoltine worms, because all experiments hitherto tried in the crossing of the various species of silkworms have invariably shown that there is always a strong tendency to revert to the strongest and healthiest species. I found this to be the case in my own experiments in crossing *B. Mori* of Cashmere with *B. Crœsi*, the Nistry of Bengal; and I think on referring to some of Mr. Bashford's experiments, you will find that he asserts the same thing. A cross between a univoltine and a polyvoltine species will produce eggs some of which will be polyvoltine *for a time*, others will be *bi*-or *tri*voltine, but the majority (unless in a hot cilmate) will revert at once to univoltines or annuals. Climate or temperature, as I long since remarked, will influence the colour of the cocoons, and this is shown in the fact that instead of "*White*" and "*Green*" cocoons my Japanese worms have all produced sulphur yellow cocoons. The eggs received from you as the produce of worms reared in Calcutta are as yet *in statu quo*, which looks very much like a reversion to annuals!

I therefore repeat my opinion that if the French are desirous of renewing their stock, instead of purchasing hybrid eggs from roguish dealers who are always ready to swear that the worms will turn out precisely what you wish, so that the eggs which are sold to one as polyvoltine, are passed off to others as *bi* or *tri*-voltine, they should depute some experienced Entomologists to visit different parts of China with a view to the rediscovery of the worm in its natural state of freedom.

Of the fate of the eggs now being deposited you shall know hereafter.

MUSSOOREE:
19th May, 1866.

IV.—*Report on the successful introduction of Fruit grafts and other plants from England into Saugor, Central India. Communicated by Capt.* JOHN TEMPLE, *Secy. of the Agri. & Hort. Society of Saugor.*

From the Proceedings of the Agricultural and Horticultural Society of India at the General Meeting on the 16th May last (published in the Delhi Gazette of the 9th instant) I observe that the Society has received a quantity of Bamboo seed from the Malda district. Should it be in your power to send me a small quantity of this seed for trial in the Public Gardens and in other parts of the district I should consider it a great favour, as attempts have frequently been made, hitherto unsuccessfully, to obtain it.

If also you should happen to have any Tobacco seed of a superior kind I should be much obliged by your sending me a little, as Tobacco (though of an inferior kind) is much and successfully cultivated in parts of the district and it is probable that a better kind would succeed equally well.

In the last para: of the proceedings above mentioned I observe mention of the successful introduction into the Punjab of a consignment of Fruit trees from Messers Waterer of Bagshot. I send a few particulars about another consignment from the same firm to the Public Gardens at this station.

A case of 30 trees was ordered from this firm in the end of September last (from an advertisement that appeared in the Home News)—*viz.*, Peach, Nectarine, Pear, Plum, Apple, Cherry, Gooseberry and Apricot, 3 different sorts of each, Currants and Raspberries, 2 of each, and 2 Moss Roses—total 30 trees. The plants appear to have been packed and despatched from England early in November 1865; owing however to various unavoidable delays they did not arrive in Saugor till *26th February last. They were contained in a simple deal box* about 4½ *feet long* by a foot and a half wide and about the same depth. At each end of the box was a small compartment, formed by a small piece of board sliding in grooves and perforated with holes, through which the stems of the trees were thrust, leaving the roots in the compartments and the stems in the body of the box. Each of the compartments was filled with a substance resembling fine sand mixed with ground bones with which the roots of the plants were wholly covered, and a tin cover was placed on the top. Neither the compartments or the box itself was in any way airtight. On taking the trees out I found them all alive and green (with the exception of the Moss Roses which were both dead), and on most of the roots, and some of the stems, white sprouts like those of a potato tuber were visible. There was not a particle of soil adhering to any of the roots, they appeared to have been carefully cleaned before packing, and the substance with which they were covered was perfectly dry.

The trees, with the exception of the Gooseberries and Raspberries, were all grafts, the stems were about 5 feet in height and about the thickness of a man's forefinger. I had them all immediately planted in flower pot-shaped bamboo baskets filled with ordinary garden soil and decayed horse dung in the proportion of about half and half, and kept them in the verandah of my house till the 23rd of April. They nearly all began to shew signs of sprouting in a few days with the exception of the Gooseberries, Raspberries, Apples and Pears. On the day above mentioned I planted them baskets and all in a cool place in the garden under a grass shed open on all sides. The Raspberries both died soon after unpacking as did one of the plums and currants. The Gooseberries all threw out quantities of leaves, but died off when the hot winds came on. One peach and one pear also died up to the juncture of the stock and scion. The remainder are now alive and doing well, though the season has been unusually hot and the hot winds most trying. The Peaches, Apricots, Nectarines, Cherries and Plums have done best of all and have some of them thrown out new shoots 2 feet and more in length. Of the Apples and Pears, only one Pear has thrown out leaves, the remainder are however all alive and the buds green and they will I expect sprout in the rains.

Before planting these trees in the ground, on the 13th of March I inserted 2 buds from each of an Apricot, Nectarine, Peach, and Plum, on country Peach stocks. All these buds succeeded and have actually thrown out strong shoots, as much as 3½ feet in length and as thick as my little finger at the point of insertion. They have never been kept under shade, but have been fully exposed to the sun and hot wind, and with the exception of one plum bud which was dried up by the latter after it had sprouted as above mentioned, seem not to have been harmed in the slightest degree. Indeed these buds have thriven much better than others taken from a country tree at the same time, and each shoot is now nearly double the size of the tree from which the bud was originally taken.

From this there can, I think, be no question but that English trees of this description will thrive well here. It remains however to be seen whether they can be made to flower at the proper season so as to thoroughly set their fruit before the hot winds.

There appears to be no difficulty whatever in getting Apricot buds to take on a Peach stock. The buds I inserted began to sprout in two days, and have as yet surpassed all the others in quickness of growth.

I shall be happy to give any further particulars, should you consider them worth having.

SAUGOR: 13*th June*, 1866.

V.—*Effects of the Cyclone of the 5th October* 1864, *on the Botanic Gardens, Calcutta. By Dr.* THOMAS ANDERSON, *Superintendent of the Garden.*

(Communicated by the Government of Bengal.)

I have the honor to submit a Report of the damages sustained by the Botanical Gardens in the Cyclone of the 5th October 1864. The number of trees uprooted is so great that the labour of ascertaining the number of specimens of the different species destroyed was not completed until the first week of March. This list had then to be arranged systematically and the antiquated nomenclature still used by the European and Native Gardeners had to be altered for that which I have adopted in the recently published catalogue of plants cultivated in the garden. Without the aid derived from the catalogue this Report could not have been submitted in its present shape under a year.

2. *The history and general character of the Cyclone as it* occurred at Calcutta have been repeatedly narrated, and are so well known to every one that no description is required here. As experienced in the Botanical Gardens, the Cyclone differed in being somewhat more violent than in Calcutta, and the influence of the storm-wave extended more inland. The greater fury of the storm in the Botanical Garden is accounted for by the garden being nearer the centre of the Cyclone than Calcutta, but principally by the open surface of the river across which the gale at its height blew diagonally and thus struck the garden with a force unbroken, for the space of a mile, by any obstacle whatever. Few trees fell before 11 o'clock on the 5th October, and almost none after 4-30 P. M. At 4 o'clock, the great specimen of *Adansonia digitata*, the Baobab tree of Africa, was uprooted and fell with a crash that caused vibrations in the earth which were felt at a distance of some hundred yards. This tree, which had withstood the greatest force of the gale, seems to have at last given way from

its roots having become loosened in the soil by the storm-wave, whose waters rose to a height of four feet on the trunk of the tree. Three gigantic specimens of *Casuarina equisetifolia*, the oldest of the species in the garden, and none of them less than 150 feet in height, fell comparatively early in the storm; one of them was seen in the act of falling about 11 A. M. Many trees, but especially *Casuarina equisetifolia*, and young specimens of teak, were not uprooted, but their stems were broken across fifteen or twenty feet above the ground, while every branch was wrenched off; they are now nothing but bare poles without a leaf. The greatest damage to the garden was caused by the storm-wave which broke over the low embankment protecting the garden towards the river at all the lower parts. This wave laid the greater part of the garden under water, in some places, to a depth of six or seven feet. By it the river bank was injured, and in some places, where the soil is sandy, much earth was washed into the river and lost. Three large breaches where formed in the river bank; two were caused by ships being blown into the garden with great violence while the storm-wave was at its highest point. The earth, loosened by the weight of the vessels, was washed away, and, at the distance of twenty feet from the western side of my house, a gap fifty feet long by twenty-seven wide and about ten feet deep was formed. A larger and deeper breach was made by a French vessel being driven into the bank opposite the seed-house. At the point where the khâl, which divides the garden near its centre, enters the Hooghly the sluice-gate was carried away along with the culvert, forming a gap about eighty feet in width, through which the tide flowed into the garden and the rice fields to the north. This has caused a large deposit of silt in the khâl. The storm-wave rushed over the garden like a torrent sweeping away the gravel (broken brick, or khooah consolidated by soorkee) from all the roads at a right angle to its course, and strewing it over the lawn and on the flower beds. Nearly two miles of road have been much damaged, while the road on the river embankment, which extends from the great khâl to Bishop's College, has been almost entirely destroyed. This wave also broke into the long chain of tanks, whose surplus waters are drained into the river about 200 yards below my dwelling-house. The sluice-gate was broken by the pressure of the water, whose sudden rise carried away the parapets of the second bridge over the nullah connecting two of the tanks, and further on, destroyed an old wooden bridge, lifting it off its masonry suppports, which were thrown down. This devastating wave overthrew almost every shrub and small tree that had withstood the fury of the wind, loosened and swept away the soil about the roots of large trees, and thus caused many of them to fall even after the great force of the storm was exhausted. The garden was covered with straw brought up by the tide and storm-wave from the villages below; many hundred cart-loads of straw were collected and burned some weeks after the Cyclone. Timber and rubbish of all kinds were scattered everywhere, and even a portion of the helm of a ship was carried a quarter of a mile into the garden and was found at the base of a large tree of *Gmelina arborea* opposite the dwelling house of the Gardener of the Agri-Horticultural Society. Near this, a log of mahogany four feet in diameter and fifteen feet long was overturned by the storm-wave, and near the centre of the garden another log two feet thick and twenty feet long was carried some distance by the receding wave.

3. The above is a sketch of the principal features of the Cyclone as it occurred in this Garden; but no description, however accurate or minute, could convey an idea of the devastation committed in the garden by this storm. The scene in the garden, the morning after the Cyclone, was most dismal: a thousand trees, many of them gigantic specimens and the pride of the garden, were prostrated, besides innumerable shrubs, of which no count could be kept; nothing had been

spared, and those trees that had not fallen were more or less stript of their branches; some, recorded as standing, were mere bare poles without a branch. Not a vestige of a leaf, flower, or fruit remained in the garden; the lawn roads and the tanks were blocked up by trees and fallen branches; all the buildings suffered more or less damage and every one not built of bricks and mortar was thrown down.

4. The buildings in the garden suffered as follows:—

Superintendent's Dwelling-house.

This house, from its exposed position, suffered much damage. All the sun-shades and five of the large venetian screens in the verandahs of the middle story were blown down, about twenty doors were wrenched off their hinges, and most of the panes of glass in the doors of the south and east sides of the house were broken. The water of the storm-wave flooded the lower rooms of the house to a depth of five inches, but no damage was sustained except the rotting of mats by the deposit of silt which took place. The seed-house being well sheltered by trees received little damage; the sand plaster was of course stript off the outer walls and a few panes of glass were broken. The floors of this building being raised four feet above the ground were not flooded.

5. The Head European Gardener's house was the only other dwelling-house that received serious damage. The second story of this house, composed of very strong mat walls supported on a parapet of masonry with brick pillars, was completely blown away: the property in the room was buried amid the ruins. A quantity of valuable Memoranda and the records of the last fifteen years of the Department under the Head Gardener were kept in this room. The greater part of these were destroyed from being buried under the thatched roof, and some were scattered over the garden and lost. The two other dwelling-houses suffered very little damage beyond the loss of one or two doors and large patches of sand plaster from the outer walls. *The visitors' pavilion; the*

extensive thatched building used as a conservatory for the Orchidaceous and other valuable plants and the raising of seeds; the Coolies' lines, and indeed all erections built of any other material than bricks and mortar were levelled with the ground. Much loss was sustained by the destruction of the thatched conservatory; all the plants it sheltered were buried under a mass of grass, or were broken by the posts and heavy wooden frame-work of the building. Many of the most delicate species of *Orchidaceæ* were entirely lost, and the number of specimens of all species was so much reduced, that now not half the fine collection of this family of plants remains. With a few exceptions, all the young plants raised from seed sown during the year were also killed by the falling of this shed.

6. In the nurseries of the stronger class of plants there were about 14,000 plants in pots when the Cyclone occurred: these were buried under the ruins of the mahogany and mangoe groves, where the plants were kept for the sake of shade. I am glad to be able to report that nearly all these plants have been saved, although they had to be left ten days under branches and trees.

7. All the plants of Vanilla growing on the stems of mahogany trees were killed either by falling of the trees to which they were attached, or by the violence of the wind. In the operations of grafting, ringing, and layering considerable loss both of time and of a valuable stock of young plants resulted from the Cyclone. The only young plants made by these processes during the year that escaped was a tolerably complete set of grafts of the varieties of mangoe cultivated in the garden; these had been removed from the trees a few days before the Cyclone. In no others had the process been completed, and accordingly all were destroyed.

8. All the damage to buildings, to rare plants in pots, and to the nursery stock is of slight importance when compared with the wholesale destruction of trees, many of them the

growth of seventy years, and the pride and ornament of this garden. Had the entire collection of plants in pots been lost, the greater part could have been re-placed in a comparatively short time, whereas even half a century will not be sufficient to restore the specimens of trees destroyed by the storm. Many of them exist nowhere in cultivation except in this garden, and some of them are known to Botanists only by dried specimens and descriptions of those trees now lost. Many of the most picturesque parts of the garden resulting from the grouping of trees, or from well developed single specimens, no longer exist. In the teak avenue, along the road from Kyd's Monument to the large bridge over the khâl, only two mutilated specimens remain. The trees in this avenue were sixty-nine years old. Out of sixty-seven mahogany trees thirty-one have been blown down, two of which were sent to this garden by the Court of Directors of the East India Company in 1796. These two trees had attained a circumference of thirteen feet six inches, and had produced seed for the last two years. The mahogany grove consisting of trees forty-five years old is destroyed. The Casuarina avenue, planted by Dr. Wallich, has suffered severely. Only four trees in it are standing, and these are much injured. Three of the originally introduced specimens of this species, and which were the parents of nearly all the Casuarinas near Calcutta, were blown down. The magnificent specimen of *Adansonia digitata*, whose diameter is twelve feet, fell towards the end of the storm after the storm-wave had passed over the garden. All the trees of *Amherstia nobilis* have been partially uprooted; they are supported merely by their branches, and all of them must be removed after young plants have been obtained from them by layering. The great Banyan received considerable damage, but fortunately on the north side, where the loss of the branches does not in the least spoil the contour of the tree. The Pinetum, containing many fine specimens of *Araucaria*, suffered much from the storm. Of about twenty-five specimens of *Araucaria* not one has been left with the main stem entire; in most of the trees nearly a third of the stem and branches remain. Among *Coniferae*, the destruction of all the trees of *Pinus longifolia* deserves notice; also of a very large specimen of *Dammara orientalis* introduced from Amboina in 1798.

9. Among all this destruction I am glad to be able to report that *Cycadeae* and palms, and indeed *Endogenæ* generally, have escaped with little injury. Only two species of palms have suffered severely, one is *Areca catechu,* the common betelnut palm, of which hardly a specimen now remains in the garden, and *Arenga saccharifera,* most of the trees of which have been blown out of the perpendicular, although few of them have been uprooted. The great destruction of exogens by the Cyclone, while endogenous species escaped, produced a peculiar effect on the scenery about Calcutta. The country as seen from the roof of my dwelling-house, a height of 80 feet, appeared to be covered with three species, of palms, *Cocos nucifera*, *Phœnix sylvestris*, *Borassus flabelliformis* and bamboos.

10. There are many points of interest that suggest themselves as worthy of notice, but they are too numerous to be included in a general Report, and besides, my engagements do not allow me time to enter on them. Some of the effects of the Cyclone on the flowering and fruiting of trees for some months after the storm must not, however, be passed over. The destruction of the foliage of the trees and shrubs at an unnatural period, and indeed at the time when the trees had ceased to grow and were maturing the woody growth of the rainy season, has had a strange influence on some species. The most general effect has been the absence of flowers in spring, and departures from the usual course of shedding of leaves. Some of the most striking cases are:—*First*, no flowers have been produced by the mangoe tree at the usual period in February and March, up to this date,

(15th April) I have not seen a mangoe flower this year. *Butea frondosa,* of which four trees remain in the garden, has retained the leaves it produced in October after the gale, and has not flowered at all. The normal condition of this tree is to remain leafless during winter, and in March to flower profusely, after which the leaves appear. The same condition has occurred in *Butea parviflora, B. superba, and B. Voigtii. Bauhinia variegata* follows the same course as the species of *Butea.* This year, although it produced a second crop of leaves in October, unlike *Butea,* it lost those leaves in December, and the only two trees of it left standing flowered most abundantly at the usual time in March, before the leaves appeared. *Terminalia catappa* and all deciduous species of *Ficus,* including *Ficus indica* and *venosa,* re-produced their leaves shortly after the Cyclone, losing their foliage as usual in the last fortnight of March and immediately acquiring their full leaf. *Bougainvillea spectabilis,* one of the most gorgeous sights of this garden in the beginning of March, has not flowered; one plant only produced about a dozen flowers. The half prostrate trees of *Amherstia nobilis,* produced altogether only one abortive spike with sickly flowers, while two young plants that flowered freely last year, and are still standing almost uninjured, have shewn no flowers. *Jonesia asoca,* which yearly vies in splendour with *Amherstia nobilis,* produced only a few ill-shaped flowers, although some of the trees are apparently uninjured. A species of *Ulmus* (*Uerosa?*), a tree about 60 feet high, has, for the last three years, flowered regularly in the middle of March before the leaf buds; this year it has remained partially in leaf all winter and has produced only three or four flowers. The flowering or fruiting of trees for the first time in India shortly after the Cyclone may be accounted for by changes resulting from the sudden check given to growth, and especially to the ripening of wood in October. I do not, however, attach much importance to the two cases of this kind that occur to me; one is the flowering of *Dion edule* about two months after the gale, and of an old specimen of *Gustavia augusta*, which has been twenty years in the garden without flowering. It was partially uprooted and lay at an angle of nearly 45 degrees, and in this position in February it produced a large number of flowers, three of which have been followed by well formed fruits. Other similar cases may occur as the year advances.

11. Some trees have been killed by the mere force of the wind, or by the violent strain they have sustained; the pressure during the height of the storm is said to have been 120 lbs. on the square foot. Some species, especially of *Dipterocarpeæ*, *Gutiferæ*, the genera *Dalbergia*, ***Pterocarpus***, *Acacia*, *Araucaria* and *Dammara* have their stems covered with exudations of resin, or gum, which have oozed through the bark on the upward flow of the sap in March.

12. There are very few species of trees in the garden of which specimens have not been thrown down; the only species that seem to have entirely escaped, and of which the specimens, with few exceptions, are unique, are:—

Dipterocarpus alatus.
Cratæva Roxburghii.
Flacourtia cataphracta.
Hydnocarpus inebriens.
Gynocardia odorata.
Eriodendron orientale.
Sterculia ornata.
———— comosa.
———— angustifolia.
Visenia velutina.
Hopea faginea.
Acer oblongum.
Ailanthus excelsus.
Erythrina indica.
Pterocarpus indicus.
Pterocarpus Dalbergeoides.
Poinciana regia.
Cassia nodosa.
Pithecolobium bigeminum.

Terminalia angustifolia.
———— citrina.
———— Berryi.
———— travancorensis.
———— tomentosa.
———— paniculata.
Nauclea parviflora.
———— cordifolia.
Mimusops hexandra.
———— indica.
Diospyros sapota.
———— embryopteris.
Spathodea Rheedii.
———— adenophylla.
Vitex saligna.
Camphora officinarum.
Beilschmiedia Roxburghiana.
Cryptocarya floribunda

13. The greater number of species of *Ficus* have also escaped. The powerful aerial roots of many of this species enable these trees to resist the most violent storms.

14. An endeavour was made to ascertain the number of specimens of trees that remain in the garden, but the time it was found that the work would occupy was longer than could be spared for more important investigations, accordingly, after examining about one-fifth of the extent of the garden, the work had to be abandoned.

15. It is apparent, from this imperfect enquiry, that at least one-half of the trees have been blown down, while nearly all that are standing are very much shattered.

16. In the following extensive list of trees uprooted by the Cyclone no account is taken of innumerable small trees and shrubs, nor of injuries to trees that may have been left standing; all such have been excluded from the list, which thus contains only species that have been thrown down and destroyed. The list contains 1,010 specimens distributed among 364 species, which is nearly the entire number of arborescent species in the garden.

List of Trees uprooted in the Royal Botanical Garden, Calcutta, in the Cyclone of 5th October 1864.

Number of Species.	Name of Species.	Number of Specimens uprooted.	REMARKS.
	Dilleniaceæ.		
1	Dillenia scabrella	1	
2	„ retusa	1	Grafted on Dillenia scabrella.
3	„ pentagyna	1	
4	„ speciosa	1	
	Magnoliaceæ.		
5	Magnolia sphænocarpa	1	Planted by Dr. Roxburgh.
6	Michelia champaca	1	
	Anonaceæ.		
7	Alphonsea ventricosa	1	Unique, introduced in 1797.
8	Saccopetalum longiflorum	1	
9	Guatteria fasciculata	1	
	Canellaceæ.		
10	Canella alba	1	
	Bixineæ.		
11	Cochlospermum orinocense	4	
12	Bixa orellana	2	
13	Flacourtia ferox	1	
14	„ inermis	1	The only original spemen of Dr. Roxburgh's planting left.
15	„ rotundifolia	1	Unique.
	Samariscineæ.		
16	Tamarix indica	1	
	Hypericineæ.		
17	Ancistrolobus carneus	3	
	Guttiferæ.		
18	Calophyllum inophyllum.	5	
19	Mammea Siamensis	1	
20	Xanthochymus pictorius	3	
21	„ dulcis	1	
22	Garcinia Roxburrghii	3	No uninjured specimen left.
23	„ purpurea	1	
24	„ cowa	3	
25	„ cornea	1	One uninjured specimen left.
	Carried over,	41	

Number of Species.	Name of Species.	Number of Specimens uprooted.	Remarks.
	Brought forward, ..	41	
	Dipterocarpeæ,		
26	Dipterocarpus lævis ..	1	Unique, introduced before 1794.
27	Shorea robusta ..	2	One specimen remaining.
28	Hopea odorata ..	1	
	Malvaceæ.		
29	Kydia calycina ..	1	
30	Hibiscus tortuosus ..	1	
31	„ macrophyllus ..	3	
32	„ tricuspis ..	1	
33	Thespesia populnea ..	1	
34	Adansonia digitata ..	2	Two small specimens left.
35	Bombax malabaricum ..	2	
36	Ochroma Lagopus ..	1	Unique, species lost.
	Sterculiaceæ.		
37	Sterculia villosa .	3	
38	„ colorata ..	1	
39	„ alata ..	1	
40	„ urens ..	1	
41	„ fœtida ..	3	All large specimens lost.
42	„ parviflora ..	1	
43	„ guttata ..	1	
44	„ pallens ..	2	
45	„ companulata ..	4	
46	„ populifolia ..	4	
47	Heritiera macrophylla ..	1	
48	„ littoralis ..	1	
49	Kleinhovia hospita ...	4	
50	Pterospermum lancæfolium ...	3	
51	„ aceroides ...	2	
52	„ acerifolium ...	1	
53	„ suberifolium ...	1	
54	Eriolæna spectabilis ...	6	
55	„ Candollii ...	1	
56	Guazuma tomentosa ...	1	
	Tiliaceæ.		
57	Grewia Asiatica ...	2	
58	Elæocarpus longifolius ...	1	
59	Berrya Ammonilla ...	3	
	Lineæ.		
60	Erythroxylon monogynum ...	1	
	Carried over, ..	106	

Number of Species.	Name of Species.	Number of Specimens uprooted.	REMARKS.
	Brought forward, ...	106	
	Rutaceæ.		
61	Xanthroxylon budrunga ..	1	
62	Clausena Sumatrana ..	1	
63	Feronia Elephantum ..	2	
64	Ægle marmelos ...	1	
	Simarubaceæ.		
65	Balanites Ægyptiaca .	1	Unique. A few seedlings raised last year remaining.
	Burseraceæ.		
66	Boswellia thurifera ..	5	
67	Garuga pinnata ...	7	
68	Balsamodendron Roxburghii ...	1	
69	Icica Indica ...	1	
70	„ Bengalensis ...	1	
71	Canarium geneculatum ...	1	
72	Filicum decipens ..	1	
	Meliaceæ.		
73	Melia composita ..	2	
74	„ sp. ..	1	
75	Azadirachta Indica .	1	
76	Epicharis exarillata ..	4	
77	Sandoricum Indicum ..	1	
78	Mallea Rothii ..	1	
79	Aglaia undulata ..	3	
80	„ spectabillis ..	1	
81	„ Midnaporensis ..	1	
82	Milnea edulis ..	1	
83	Amoora Rohituka ..	4	
84	Walsura robusta ..	1	
85	„ piscidia ..	1	
86	Heynea trijuga ..	1	
87	Swietenia mahogoni (old) ..	32	
88	„ „ (young ..	12	These plants were 12 years old.
89	„ chloroxylon ..	8	
90	Soymida febrifuga ..	3	
91	Chickrassia tabularis ..	8	
92	Cedrela Toona ..	2	All the large trees lost
	Olacineæ.		
93	Olax scandens ..	1	
	Celastrineæ.		
94	Euonymus grossus ...	1	
95	„ glabra ..	1	
	Carried over ..	220	

Number of	Names of Species.	Number of Specimens Uprooted.	Remarks.
	Brought forward, ..	220	
96	*Celastrineæ.*—(Continued.)		
97	Celastrus fascicularis ..	1	
98	Elaeodendron longifolium ..	1	
	„ glaucum ..	1	
	Sapindaceæ.		
99	Cupania canescens ..	1	
100	„ sapida ..	1	
101	„ Madagascariensis ...	1	
102	Scytalia mangifolia ...	1	
103	Schleichera trijuga ...	1	
104	Erioglossum edule ...	3	
105	Sapindus angustifolius ...	1	
106	„ emarginatus ...	3	
107	„ Saponaria ...	2	
108	Nephelium Litchi ...	1	
109	„ longana ...	1	
110	Harpulia cupanioides ...	2	
	Sabiaceæ.		
111	Meliosma simplicifolia ...	2	
	Anacardiaceæ		
112	Ruhs parviflora ...	1	
113	Mangifera indica ...	43	
114	„ (Singapore) ...	2	A few small plants left.
115	Bouca oppositifolia ...	2	
116	Buchanania latifolia ...	1	
117	„ angustifolia ...	1	
118	Melanorrhœa usitatissima ...	8	One plant left.
119	Schinus terebinthifolus ...	2	
120	Semicarpus Anacardium ...	1	
121	„ cuneifolia ...	1	
122	Holigarna racemosa ...	3	
123	Spondias sp. ...	1	
124	„ lutea ...	1	
	Moringaceæ.		
125	Moringa pterygosperma ...	2	
	Leguminosæ.		
126	Agati grandiflora ...	1	
127	Erythrina ovalifolia ...	2	
128	„ stricta ...	4	
129	Butea frondosa ..	3	
130	Pterocarpus marsupium .	5	
131	Pongamia glabra ..	3	
	Carried over, ..	326	

Number of Species.	Names of Species.	Numbers of Specimens uprooted.	**Remarks.**
	Brought forward,	326	
	Leguminosæ.—(Continued.)		
132	Pongamia heterocarpa	1	
133	" tetraptera	4	
134	Dalbergia sissoo	35	
135	" Zeylanica	4	
136	" frondosa	1	
137	" latifolia	1	One much injured specimen remains.
138	" scandens	1	
139	" sp. (Madras)	1	
140	Colvillea racemosa	1	
141	Poinciana regia	2	
142	Lebidibia coriaria	1	
143	Jonesia Asoca	11	
144	Tamarindus indica	5	
145	Hymenæa courbaril	4	
146	Phanera Richardiana	5	
147	" purpurea	9	
148	" parviflora	1	
149	" retusa	2	
150	Hardwickia binata	4	
151	" pinnata	1	Unique.
152	Parkia biglandulosa	2	
153	" Brunonis	1	
154	Prosopis spicigera	1	
155	Cassia emarginata	1	
156	" fistula	1	
157	" grandis	1	
158	" Sumatrana	1	
159	Xylia dolabriformis	2	
160	Pithecolobium dulce	5	
161	Acacia serissa	4	
162	" tomentosa	1	
163	" catechu	6	
164	" sundra	1	
165	Albizzia stipulata	1	
166	" elata	1	
167	" paludosa	1	
168	" Smithiana	1	
169	" odoratissima	3	
170	" diluta	2	
	Rosaceæ		
171	Photinia bengalensis	1	
	Carried over,	457	

Number of Species.	Name of Species.	Number of Specimen uprooted.	Remarkes.
	Brought forward,	457	
	Rosaceæ.—(Continued.)		
172	Photinia eugenifolia	1	Terminaliæ have hardly suffered at all. Many specimens of all except the undescribed species, remain.
	Combretaceæ.		
173	Terminalia chebula	3	
174	„ tomentosa	1	
175	„ catappa	2	
176	„ Belerica	1	
177	„ Arjuna	3	
178	„ procera	1	
179	„ sp.	2	Unique, entirely lost.
180	„ oblonga	1	
181	„ bialata	1	
182	Conocarpus latifolius	2	Only a few small seedlings remain.
	Rhizophoraceæ		
183	Carallia lucida	9	
	Lythraceæ.		
184	Lagerstrœmia regina	1	
185	Byrsonima lucida	1	
286	Lafœnsia vandelliana	2	Two small specimens two years old remain.
187	Duabanga sonneratioides	1	
	Alangiaceæ.		
188	Alangium decapetalum	1	
	Myrtaceæ.		
189	Eucalyptus resinifera	2	
190	Callistemon salignum	3	
191	„ lanceolatum	1	
192	Metrosideros vera	2	
193	Eugenia geminiflora	2	
194	„ jambolana	6	
195	„ myrtifolia	10	
196	„ malaccacensis	2	
197	„ pulchella	1	
198	Psidium pomiferum	1	
199	Melaleuca cajuputi	1	
	Samydaceæ		
200	Homalium tomentosum	2	
201	„ longifolium	1	
	Carried over,	524	

Number of Species.	Name of Species.	Number of Specimens uprooted.	REMARKS.
	Brought forward, ...	524	
	Araliaceæ.		
202	Tupidanthus calyptratus ..	1	
	Rubiaceæ.		
203	Rondeletia tinctoria ..	2	
204	Hymenodictyon thyrsiflorum ..	2	
205	Nauclea cadamba ..	5	
206	„ macrophylia ..	1	
207	Randia rubiginosa ..	1	
208	„ uliginosa ..	4	
209	„ decussata ..	3	
210	Gardenia longispina ..	1	
211	„ latifolia ..	5	
212	„ turgida ..	1	
213	„ sp. ..	1	
214	Ixora parviflora ..	7	
215	Canthium floribundum ..	3	
216	Morinda exserta ..	1	
217	„ bracteata ..	1	
	Sapotaceæ.		
218	Sapota Achras ..	1	Several specimens re main,
219	Sideroxylon attenuatum ..	4	
220	Sideroxylon inerme ..	1	
221	Bassia longifolia ..	1	
222	„ latifolia ...	1	
223	„ butyracea ...	1	
224	Imbricaria coriacea ...	1	
225	Mimusops elengi ..	1	
226	„ kaki ..	1	
	Ebenaceæ.		
227	Diospyros ebenum ..	1	
228	„ montana ..	4	
229	„ heterophylla .	1	
230	„ lancæfolia ..	3	
231	„ sp. ..	1	
232	„ sp. ..	1	
233	„ sp. ..	1	
	Jasminaceæ.		
234	Olea Europea .	4	One much injured old tree remains.
235	Visiania paniculata ..	5	
236	„ robusta ...	2	
237	Olea myrtifolia ..	1	
238	„ grata ..	1	
	Carried over. ...	600	

Number of Species.	Name of Species.	Number of Specimens uprooted.	Remarks.
	Brought forward	600	
	Jasminaceæ.—(Continued.)		
239	Olea glandulifera	4	Probably lost, except as regards seedlings in pots.
240	Linociera dichotoma	3	
241	„ macrophylla	8	
242	Noronhia emarginata	11	
243	Nyctanthes arbor-tristis	1	
	Apocynaceæ.		
244	Plumeria acuminata	1	
245	„ alba	1	
246	Wrightia mollissima	1	
247	Alstonia macrophylla	5	One tree left standing.
248	„ scholaris	2	No large trees exist.
249	Holarrhena antidysenterica	4	
250	Thevetia neriifolia	1	
	Loganiaceæ.		
251	Strychnos potatorum	1	
252	„ spinosa	1	
	Bignoniaceæ.		
253	Stereospermum fimbriatum	1	
254	„ sp.	1	
255	„ sp. (Pegu)	1	
256	„ chelonoides	4	
257	„ suaveolens	1	
258	Spathodea amœna	3	
259	„ xylocarpa	2	
260	„ crispa	5	
261	„ serrulata	1	
262	„ stipulata	1	
263	„ campanulata	2	
264	Calsonthes indica	3	
265	Millingtonia hortensis	1	
266	Kigelia pinnata ...	4	
267	Crescentia alata...	4	
268	Tecoma undulata	3	Two small plants a year old remain.
269	„ serratifolia	1	
	Boragineæ.		
270	Cordia myxa ...	1	
271	„ sebestena	5	
272	„ lævis	1	
273	„ tectonifolia	1	
274	„ bantamensis	1	
	Carried over,	691	

Number of Species.	Names of Species.	Number of Specimens uprooted.	REMARKS.
	Brought forward, ...	691	
	Boragineæ.—(Continued.)		
275	Cordia angustifolia ...	1	
276	„ grandis ...	3	
277	Ehretia lævis ...	1	
	Verbenaceæ.		
278	Citharexylon subserratum ...	3	
279	Tectona grandis (old) ...	52	The majority of these is nearly seventy years old.
280	„ „ (young) ...	30	From fifteen to twenty-five years old.
281	„ ternifolia ...	3	One specimen left.
282	Premna spinosa ...	2	
283	Callicarpa arborea ...	2	
284	Gmelina arborea ...	4	
285	„ asiatica ...	1	One injured specimen left.
286	Vitex alata ...	1	
287	„ leucoxylon ...	1	
	Nyctaginaceæ.		
288	Pisonia inermis ...	1	
	Polygonaceæ.		
289	Triplaris Americana ...	2	
	Proteaceæ.		
290	Grevillea robusta ...	4	All the old seed-bearing trees have been destroyed.
	Aquilariaceæ.		
291	Aquilaria agallochum ...	3	
	Santalaceæ.		
292	Santalum album ...	5	
	Lauraceæ.		
293	Cinnamomum malabathrum ...	2	
294	Tetranthera Roxburghii ...	1	
295	Tetrandenia foliosa ...	3	
	Celtideæ.		
296	Ulmus integrifolia ...	1	
297	Celtis tetrandra ...	2	
298	„ sinensis ...	1	
	Moraceæ.		
299	Artocarpus Chaplasha ...	1	
300	„ integrifolia ...	4	The species is lost except a small seedling in a pot.
	Carried over, ...	825	

Number of Species.	Name of Species.	Number of Specimens uprooted.	REMARKS.
	Brought forward,	825	
	Moraceæ.—(Continued.)		
301	Artocarpus Lackoocha	3	
302	„ incisa	3	
303	Ficus artocarpifolia	3	No large trees left.
304	„ indica	1	
305	„ conglomerata	1	
306	„ Roxburghii	1	
307	„ excelsa	1	
308	„ religiosa	2	
309	Brosimum Alicastrum	1	
310	Streblus asper	2	
	Euphorbiaceæ.		
311	Aleurites triloba	1	
312	Croton joufra	2	
313	„ oblongifolium	1	
314	Cleidion Javanicum	2	
315	Trewia nudiflora	2	
316	Rottlera tinctoria	1	
317	„ tetracocca	1	
318	Stillingia sebifera	1	
319	Omalanthus sp.	1	
320	Pierardia dulcis	1	
321	Hemicyclia sepiaria	2	
322	Briedelia amæna	1	
323	„ lancæfolia	1	
324	Amanoa attenuata	3	
325	„ Berryana	1	
326	Phyllanthus tremulus	7	
327	Emblica officinalis	1	
328	Bischofia Javanica	1	
329	Glochidium lancæfolium	1	
330	Putranjiva Roxburghii	1	
331	Cluytia collina	1	
332	„ oblongifolia	1	
333	Antidesma Bunius	1	
	Casuarinaceæ.		
334	Casuarina equisetifolia	19	All the oldest trees have been lost.
335	„ „ (young)	8	
	Coniferæ.		
336	Juniperus Virginiana	2	
337	Cupressus torulosa	2	
338	„ sempervirens	3	
	Carried over,	912	

Number of Species.	Name of Species.	Number of Specimens uprooted.	REMARKS.
	Brought forward, ...	912	
	Coniferæ.—(Continued.)		
339	Pinus longifolia ...	5	All the trees have been lost. There are a few plants under five feet left.
340	„ khasyana ...	1	Unique species lost.
341	Araucaria Bidwillii ...	1	
342	„ Cookii ..	1	
343	„ Cunninghami ..	1	
344	„ excelsa ..	4	The largest trees remain.
345	Dammara orientalis ...	2	One specimen introduced in 1797. No trees of this species exist here now.
346	Podocarpus Maki ...	1	
347	„ nereifolia ...	1	
	Cycadaceæ.		
348	Cycas circinalis ...	1	C. Sphærica, Roxb.
349	„ Rumphii ...	5	Many specimens remain.
350	Ravenala Madagascariesis ...	1	
	Palmaceæ.		
351	Oreodoxa oleracea ...	2	The original trees introduced by Lord Auckland remain.
352	Areca catechu ...	39	
353	Arenga saccharifera ...	4	
354	Caryota urens ...	3	
355	„ obtusa ...	4	
356	„ sp. ...	4	
357	Borassua flabelliformis ...	1	
358	Corypha umbraculefera ...	1	
359	Livistona sinensis ...	1	
360	Chamærops Martiana ...	1	
361	Phœnix sylvestris ...	1	
362	Cocos nucifera ...	8	
	Pandanaceæ.		
363	Pandanus odoratissimus ...	1	
	Gramineæ.		
364	Bambusa gigantea ...	4	One specimen left.
365	„ arundinacea ...	1	
	Grand Total, ...	1,010	

17. Dr. Wallich drew up a very full Report on the effects of the gale of 3rd June 1842.* It appears from his Report that that storm did great damage to the garden. Dr. Wallich states that 362 trees were blown down. I observe that in this number he includes shrubs sometimes not more than five feet high, and he points out that of the 362 trees blown down 106 were teak trees, many of which were of large size.

18. This Gale of 1842 happened before Mr. Griffith had denuded the garden of most of its fine timber trees. The garden was then thickly covered with trees, and accordingly the number lost in that gale bore a very small proportion to the vast number left standing. In May 1843, eleven months after the gale, Mr. Griffith, in his Report to Government, says—"At present the garden is literally choked with trees." Had more trees existed in the garden when the Cyclone of last October occurred, it is most likely that less damage would have been sustained, as the trees would have sheltered each other. In a garden liable to be devastated at any time by furious storms, every arborescent species should be represented by at least five specimens. Unique specimens of many species must always exist, but still the endeavours of the Director should be to procure, if possible, five specimens of each species.

VI.—*A few remarks on Mr. Macknight's and Dr. Maddens Observations on the true principles of Breeding.*†—*By* Dr. David Scott, *Bengal Medical Service.*

In many cases the words Pure Breeding mean simply Inbreeding and in this pamphlet there are numerous examples given, of distinct Breeds, being derived from so few individuals, and continued to be so bred within the descendants from them that however numerous they may be, they are still practically of the same blood.

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* For this Report, see Journal, vol. I. page 3.—Eds.

† These observations will be found in the present Number of the Journal.—Eds.

That the true method of perpetuating and adding to desired qualities is by inbreeding there is no doubt.

But that this does not produce weakness of constitution is not so certain,

It has always been believed that the higher the breeding of dogs, so much more fatal is the distemper amongst them, but I do not know if any investigation has ever been made, as to what effect inbreeding has in their case in this respect.

Mr. Macknight gives numerous examples of animals much inbred, retaining vigorous constitutions with the desired qualities for which the inbreeding was carried on, and I could add to the number, but the following two cases will show distinctly, that pure bred animals suffered more than crosses.

1st. At our Farm at home before the cattle plague broke out, there were 120 cattle, of which somewhere about 40 were sold, leaving nearly 80 to be accounted for,

There were 3 Pure Bred Black Polled Angus Bulls and 10 cows, with 3 cows not pure.

Of the exact number of pure young cattle I am not sure, but from calves to 3 year old, there would be probably nearly 30. The other cattle would be mixed breeds, bought in markets, with crosses from our Bulls and cows not pure.

Up to last mail* there had been 63 deaths and 12 or 13 had either not taken it or had recovered.

Of the Pure Breed, One yearling Bull alone survived, and he was not considered quite safe.

Two cows not of the Pure Breed recovered. Of these one was a cross by one of our Bulls out of a Bengal Cow, and curious to say, amongst the other recoveries two were her produce *viz.*, a year old and a calf.

The universal experience in our neighbourhood, was, that Pure bred cattle suffered more than crosses, and I had the question put to me two mails ago, as to whether I considered, that the constitutions of these High Bred cattle had been weakened by inbreeding.

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* Written in March 1866.

Our Pure cattle were all more or less inbred, not to the extent generally, of many cases mentioned in the pamphlet, but still very decidedly so, and I rather think there were one or two of as near inbreeding, as Mother and Son.

I believe the same remark applies to all the Pure bred stock, in that part of the country.

And the mortality was equally great in the case of Highbred Shorthorns, for of 14 cows, one of our neighbours did not save one. They were of the Bates Blood, noted in Para: 6 page 15 of the Pamphlet and therefore much inbred.

2nd. In my kennel of Greyhounds here, there was last year an epidemic; from which 12 of mine and 3 belonging to a Friend died.

These were all Pure bred and a good many of mine were inbred, but not very near.

In the same kennel and exposed to precisely the same risks I had 3 cross breds.

One was ½ Bull *i. e.*, Her sire was an Imported Greyhound and her dam an Imported Bull Bitch.

The other two were ¼th Bull, by the same sire but from different dams.

The first had the disease very severely, but was convalescent, when sent to the Hills.

The other two had the disease so slightly, as not to require any treatment or change, whilst not a single Pure bred Dog escaped it or recovered here, though I saved a few by sending them up hill.

In neither of these cases can it be said positively that the inbreeding had anything to do with the fatality, but it was perfectly plain and clear, that, cross-bred animals did not suffer to the same extent as the Pure.

I give these two illustrations to show that animals of Pure breed are in certain cases more liable to disease than others, not pure.

With regard to the special instance in question viz. the proposed cross of the Angora goat with the common one, I would entirely agree with Mr. Macknight in protesting against any such proposal: The bad effects of inbreeding are only possible, whereas the deterioration of the special quality for which the Angora goats are introduced, is quite certain, if any cross is used.

There is much more fear of deterioration in the Angora goat from the climate than from inbreeding.

As far as this country is concerned, inbreeding has been going on perpetually, and no selection of animals for breeding, having generally been made, the result has simply been, that good and bad qualities have alike been perpetuated.

If animals were carefully selected for Breeding amongst the Native Breeds, great improvement could be effected, but so long as this is not done, it matters very little whether they are inbred or not.

We cannot hope in this country, to introduce generally, any of the Improved Breeds of the animals of Pure Blood *i. e.*, we cannot establish the Short horn or Leicester as a breed, and for the same reason, that the Pure European race of men will not live beyond a certain number of generations, viz. the climate. In the same way the inevitable tendency of all European Stock in this country is to degenerate, even if kept perfectly pure.

Whether mixed Breeds of cattle of European and Native Blood could be established and then perpetuated by Breeding "inter se" is I am afraid very doubtful, but it is only either by this method or by selection in the Native Breeds that improvement can be looked for.

The greatest drawback in this country in any attempt by Europeans to improve the Breed of animals, is from the want of permanency in the trial. No fixed or settled improvement can be looked for under a number of generations and how few Europeans can hope or expect to see anything of the kind.

Take the Government Studs or Cattle Farm for instance and see the changes that take place.

Many men no doubt have been in the Stud for a good many years, but not in a position which gave any power to institute a system of Breeding and carry it out.

If Government should ever establish Model Farms with Breeding establishments attached, then let them select as Superintendent, some one who has a long Indian career before him, so that there may be a hope, that when a proper system has been established, it will be persevered with.

In the pamphlet instances are given of Breeding going on for many years with the same system they had begun with, and nothing can be more fatal to all hope of success in these matters, than frequent changes of management. The Breeding of Pure bred Angus cattle on our farm, was begun by my Father more than 40 years ago and has been carefully carried on ever since.

Of the difficulties or impossibility of getting rid of the evil of impure blood as stated in para: 4 of the pamphlet, I can give an example within my own knowledge.

Inbreeding having been thought to have been carried far enough in our Herd a Polled Angus Bull, believed to be of pure blood, was bought to use as a cross.

But he proved a most unfortunate purchase, for there is no doubt he must have had Short Horn Blood, as from that time (though he was got rid of as soon as possible), yellow calves made their appearance occasionally, and this from descendants of this Bull, several generations distant even, from him, and only from them.

Now in our own breed we never had had anything but the proper black, and therefore there was no doubt that it came in through him.

It is perfectly notorious in the Human Race as well as in animals that certain peculiarities disappear for generations and suddenly crop out, in the most unexpected manner, and I could with perfect ease give examples in Indian life.

Mr. Macknight gives so many instances of valuable Breeds kept up and continued by inbreeding that it is quite unnecessary for me to add to them.

Nevertheless I give below the Pedigree of an Italian grey hound extracted from Stonehenge, showing even a greater amount of inbreeding than almost any example given in the Pamphlet.

- Prince
  - Bill came from Italy.
  - Viola.
    - Bill as above.
    - Chum.
      - Bill as above.
      - Myrtle.
        - Bill as above.
        - Zido.
          - Bill as above.
          - A Bitch from Italy.

This simply means that Viola had $\frac{15}{16}$ths of the blood of Bill with only $\frac{1}{16}$th of other blood and Prince only $\frac{1}{32}$th.

In the case of a Grey hound now in my kennel though the inbreeding is not anything so close as the above, yet it is very decided. See Pedigree of Sally.

Extending the Pedigree to six generations the name of King Cob appears in it 8 times. Grandson and daughter of that dog are the nearest relations and that occurs twice with the same parties, and grandson (inbred also) with grand daughter occurs twice, and a great grandson with this much inbred granddaughter occurs also.

Taking her all in all this Greyhound with the 8 Lines of King Cob is without exception the best I ever had in my kennel. Fast, close, and lasting, she runs as true in her 6th year as she did as a puppy and is of the very highest courage.

I dont think she has ever had a dose of physic in her life, so her constitution is certainly uninjured by her being inbred and I am going to breed from her by a Dog with almost as much King Cob Blood as herself and whose grand sire Motley appears on both sides of her own Pedigree.

Altogether whilst prepared to agree with Mr. Macknight in very much of what he says, yet I certainly cannot do so with his para: 3 page, 28.

Paras. 1 and 2 may very well be true and correct, without 3 being a natural sequence, and many examples could be found of crosses of *pure* blood being distinctly advantageous.

If inbreeding is the proper system of increasing good qualties, it follows as a natural consequence that it will be equally powerful in increasing bad ones, and therefore I can only repeat what has been frequently said before viz that if care is not taken to have proper animals selected for breeding, it is quite as likely that any evil as any good qualities they may have, will be increased and perpetuated.

On Dr. Maddens letter I will only make a very few remarks. His "Diversity begets variety" is simply a very concise way of expressing what I said in the paper formerly read before the Society (See page 89) viz. that when much crossed animals are used for breeding, what the produce will be is quite a lottery.

His examples of inbreeding in gregarious animals are no doubt correct, more especially where the numbers are limited.

And he might have said that relationship as Parent and offspring, is only recognized on the maternal side as a general rule, for in a vast majority of instances if a male animal takes any care of the young of the breed, it is on general and not on special grounds, *i. e.*, he takes no more interest in his own, than in others, but defends them as a measure of general safety.

With regard to the paragraph about Pigeons he is certainly as far as my experience goes not correct.

If there are two young ones in the nest they are quite as often both of one sex as of two and, moreover, when of opposite sexes, more especially where they are numerous, they do not as a general rule breed together and for the following reason *viz.*, the hen is generally fit to breed before the cock and therefore, if there are any unmated males ready, the chances are she will pair with one of them.

If there are numbers of Pigeons and the place is crowded the male has as a general rule to get possession of a domicile by fighting, and with Pigeons as with the human race, other things being equal, the gentleman owning house and land, is decidedly more eligible than one who does not.

The tendency of all breeding is no doubt to follow the purest blood in the race, and the throwing back of the Pigeon to the blue bar on the wing, I have seen over and over again in my own Pigeon house.

In the pamphlet, many points in favour of inbreeding are taken from Stonehenge but nothing against it. Nevertheless it is but right that it should be pointed out that at page 142 in his Book of the Horse when comparing the relative merits of inbreeding and out crossing he states. "That it may be laid down that nearly an equal number of good horses have lately been bred by adopting either mode of proceeding but that no first rate horse has appeared whose Parents were incestuously allied."

And he goes on to add that long continued inbreeding is apt to develope weak points in the constitution.

Whilst therefore pointing out the advantages to be derived from inbreeding to a certain extent, he at the same time distinctly gives warning of what he believes to be the danger.

When it is a matter of choice between using near relations, or inferior blood, I should not hesitate a moment in employing the former.

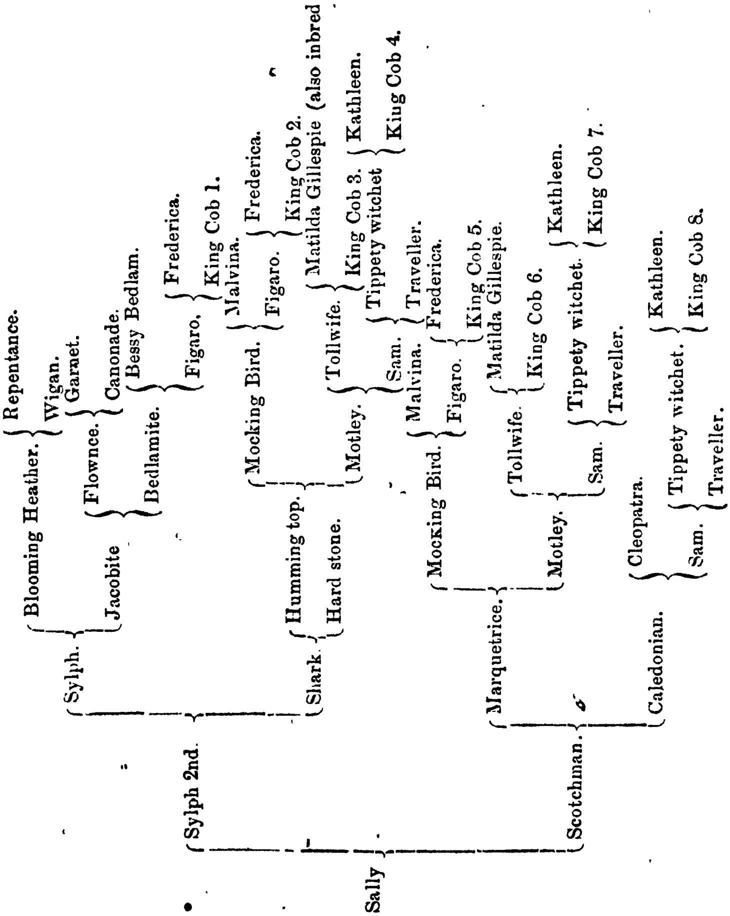
Where also it is desired to transmit and increase certain qualities I should do the same, but under circumstances where there is a choice between animals both *pure bred*, of which one is inbred and the other is not, it certainly appears to be the general opinion, that it is safest to use the one not inbred.

In establishing a distinct breed there is often no choice in the matter at all, and in a very few generations though the animals are of the same blood yet they gradually get farther away from close relationship, still keeping quite pure.

This is all I have got to say, except once more to repeat that without a proper system of breeding by careful selection of animals and preseverance in carrying it out, all attempts at improvement in stock must be futile. In the way of breeding, a generation in the case of horses cannot be less than 4 years, in the case of cattle about the same, and as it takes a number of generations to acquire and fix anything like a new form or quality, so if time and care in carrying such trials out are not given, all hope of success must be fallacious.

I have to apologize for what may seem egotism in introducing so many as it were personal incidents but it seemed to me to be better to do so, because they had occurred under my own observation.

It will be observed that Marquetice and Hunmingtop are full sisters and I may mention that they were of the same litter and very much inbred indeed, both Motley (very much inbred) and Mocking Bird being of King Cob blood, these two having infact in the Marquetice litter brought together six lines of King Cob Blood. In the next generation the name of Motley again comes in and a fresh line is introduced through Jacobite Bedlamite and Figaro; so that though the preponderance of that Blood is very great yet in next generations the relationship is not very close.



Pedigree of on Inbreed greyhound, having 8 lines of King Cob Blood.

VII.—*Memoranda respecting three fleeces of Wool presented to the Society, by* J. A. CRAWFORD, ESQ.

The fleece which I have presented to the Society was shorn from a China Ewe on the 28th ultimo. The Ewe was one of three China sheep (a Ram and two Ewes) which were purchased for me by Captain Bolton of the steamship *Reiver.* They are all three white sheep, one has no stain of color at all, the other two (the Ram and a Ewe) have the slightest possible stain of a reddish tan color about the ears. The Ram from the appearance of its fleece when it arrived, must have been shorn shortly before it was purchased. All three sheep appeared to feel the heat very much on first arrival, 8th April. When however the very hot weather set in towards the close of the month, the Ewes seemed to feel the heat more than the Ram. This I attributed to the fact of their having their fleeces on, but I do not think that they had even then got their full fleeces. I immediately determined on shearing them. For this purpose I got a pair of English shears. My goat-herd who seems to know something about sheep, was set to work at once on one of the Ewes. In reply to my questions he stated, in the most confident manner, that he knew all about sheep shearing; of this I believed just as much as I thought proper to do. The manner on which he set about his work soon showed me that though he could clip a sheep, he had no idea of shearing one. The consequence was that the wool was taken off in small quantities. This was on the 26th. On the 28th I had the other Ewe brought up before me, and having had it cast I shewed him how to commence and set him to work. It was with some difficulty I could get him to work my way. First he tried to argue the question with me as to the use of following my directions and then to complain of the trouble. I sat by him however and at last got half the fleece pretty fairly shorn. At this moment I was called away. On leaving I gave strict orders that he was not to go on shearing but merely to turn the sheep and await my return. I was not away more than a minute or so. On my return I found that my orders had been obeyed, but was horrified at catching the man in the act of separating the half fleece already shorn from that which was still on the sheep. Luckily I was in time to save the connection between the two at the neck, and eventually had the satisfaction of taking off the fleece in the state in which it now lies on the Society's table. Looking to the fact that the connection of the fleece has been preserved at the neck, the most difficult part of the sheep to shear, I have not the last doubt but that the whole fleece could have been shorn as one entire peice. Considering that it is now over 20 years since I was present at a sheep shearing, and that the man had never shorn a fleece on this mode before, I think it will be admitted that it is very fairly shorn.

These three sheep of mine are of the club tailed or Dumba breed. Their tails are however nothing like so large as those of the Cape sheep or the Dumbas from the Northern Provinces and Affghanistan. I am told that my sheep are of a breed which is remarkably prolific, twin lambs being the rule and three at a birth not an uncommon occurrence. Whether they will retain their prolific properties in this climate remains to be seen. From want of ground I am unable to experiment as largely as I could wish, but I intend to try on a small scale an experiment in crossing with the Patna and common Bengali sheep.

Doubts have been expressed to me as to whether it is possible to shear a Patna sheep so as to preserve the fleece entire. I hope I shall be able to solve these doubts shortly as I have the offer of some Patna sheep with fair fleeces to experiment on, and in the course of next month I shall be in a position to report the result to the Society.—*Calcutta,* 24*th May* 1866.

I send you herewith two packets of wool, one done up in plain paper, the other in a Newspaper. The former is the wool of a Patna Ewe, the latter is from a half bred Ram, bred from China and Patna stock. These two sheep were placed at my disposal by Mr. J. Sheriff of Hunter and Co. with a view to making a trial of shearing from them an entire fleece. The result has been a dead failure. I had both sheep carefully washed this morning, and both were shorn in my presence. From the first clip of the shears I saw it was hopeless to expect the fleece to come off entire from the Ewe, and though the same care and pains were taken with it as my China sheep, the fleece of which is with the Society, it was impossible to prevent the wool coming away in bits. The same was the case with the Ram, except that just along the ridge of the back the wool seemed to be of closer texture and I had hoped from this that I should have got that piece of it off in a long strip; but the application of the shears showed at once that it was not to be done. The wool of the Patna Ewe does not appear to have much of the character of English wool, but to partake more of the quality of goats hair. The wool from the Ram I think will be acknowledged to be better than that from the Ewe and its superiority is doubtless attributable to the cross of the China sheep, at the same time I think it is clear that one cross is not enough to remove the defect in the wool of the Patna sheep or to impart the good quality of the wool of the China sheep. In writing thus I trust it will be borne in mind that I am merely comparing these two breeds and that I do not by any means intend that the quality of the wool of the China sheep should be held to be good as compared with the quality of English wool.

I sat and watched over the process of shearing both these sheep this morning, and I do not know it will be ever possible to get an entire fleece off a sheep of either breed.—*7th June*, 1866.

VIII.—*Memorandum on the Travancore Government Garden at Peermade.*—*By Dr.* H. CLEGHORN.

1. The proposal to establish a Government Garden upon the Travancore Ghats, for the introduction generally into that mountainous tract, of useful and ornamental plants, as Tea, Coffee, Vanilla, &c., but more especially for the naturalization of the Chinchona tree, originated with Mr. F. N. Maltby, the late Resident, and was in every respect an admirable one.

2. Mr. Maltby in his Memorandum dated 23rd December 1861, considered that Peermade, or rather the new station called "Mary Ville," on the proposed line of road from Alleppey to Madura, and forty-seven miles distant from Kotiam, afforded suitable advantages. It is healthy, open to the sea breeze, with an elevation of 3,300 feet above the sea, and enjoys a temperate climate; the adjoining district presents a remarkable variety of soil and scenery. Between it and the Perryar river is an undulating plateau, where forests alternate with grass lands, affording fine pasture for cattle.

3. Near Peermade, on the same range of mountains, appropriate sites may be found, up to an elevation of near 6,000 feet, where subsidiary plantations might be formed to suit the different species of Chinchona.

4. The rain-fall, according to the observations of General Cullen, who kept a register for a long series of years, varies from 40 inches on the eastern Ghats to 125 inches in the western slopes, diminishing towards Cape Comorin; while the thermometric register of Mr. Maltby at Peermade in December 1861, shews that the mercury fell to 58° Fah. in the early morning, and rose to 74° Fah. at 2 P. M. in the shade. Farther observations with *maximum* and *minimum* thermometers would be very valuable.

5. To carry out Mr. Maltby's project, His Highness the Rajah of Travancore sanctioned the following sums:—

1,000 Rupees for the garden and glass house.

300 " " for plants and seeds from the Neilgherries.

40 " " monthly for Gardeners and Coolies, with the promise of a suitable grant for seeds and plants as required. These sums were applied to the preliminary works in 1862. In March 1863 about 500 Chinchona plants, two months old, and from one to two inches high, were brought from Ootacamund by Mr. Hannay, the Superintendent of the Garden, but more than half were lost, some in transit, and others soon after arrival from the effects of exposure to drought, damp or cutting winds, as the glass house was not ready for their reception.

6. I visited Peermade in company with Mr. Markham in December 1865, and remained two days. Although Mr. Maltby's scheme has not been followed out in detail, it is satisfactory to record that the Tranvancore Sircar has well seconded the efforts of the British Government, and that the result of the Chinchona experiment is more successful here than any where else in Southern India, excepting on the Neilgherries. The accompanying table gives the age and height of the plants at the date of our visit.

Peermade Chinchona Nursery, December 1865.

Names of Plants.	No.	Height.	Age.	Height of tallest tree.
			y. m.	
Chinchona Succirubra,	79	5 feet, ..	2 10	8 feet, 6 inches.
Do. Micrantha,	45	3 ft. 6 in.	do.	6 feet.
Do. Peruviana,	27	3 feet, ..	do.	6 feet.
Do Nitida,	7	2 ft. 6 in.	do.	3 feet.
Do. Officinalis,	60	2 ft. 6 in.	do.	4 feet, 7 inches.
Do. Unknown,	6	....	do.	3 feet, 6 inches.
	225			About 200 were also raised from layers and cuttings.

7. The girth of several of the largest of the *C. Succirubra* was nine inches close to the ground, and their height for their age was generally satisfactory; some of the plants had been broken by the violence of the wind, but were in a healthy

state, throwing out strong shoots from the seat of injury. The Chinchonas planted in the shola behind the Sircar bungalow had suffered comparatively little from the wind. *

8. The species that thrive best are *C. Succirubra* and *C. Micrantha*, but *C. Calisaya* should be tried. The *C. Condamania* (or *Offioinalis*) is evidently planted at too low an elevation, being weak and delicate, with a tendency to throw out branches along the ground.

9. The Peermade garden has a southern exposure, and receives full burst of the south west monsoon, from the violence of which all the plants above the size of dwarf shrubs, have suffered in some degree ; but as the Government have in view the dissemination of seeds and seedlings rather than the formation of a large plantation, it does not seem advisable to change the site, particularly as a glass house and Superintendent's cottage have been already built ; the present nursery, however, might be sheltered by planting screens of Australian Acacias,† or other quick growing trees, and the garden might be extended in the shola behind, which is sheltered from the prevailing winds.

10. The experiment of Chinchona introduction having been thus far successful, it is now desirable that the Travancore Sircar should furnish the means of extended culture to the planters of this rising settlement, and to the neighbouring ranges of hills, as opportunities may arise ; I therefore beg to suggest that twelve grown plants of *C. Succirubra* be at once given to each of the planters, who are ready and desi-

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* It should be remembered that though shelter is highly advantageous, the plants should not be overshadowed or exposed to the drip of other trees. (See Mr. McIvor's Reports.)

† *Acacia lophantha*, a fast grower, and not affected by drought, is most useful for protecting plantations. Seeds of this species and of *A. Melanoxylon* and *mollissima* have been despatched to Mr. Hannay.

The *Cassia florida*, which flourishes so well at Bangolore, is hardy and a fast grower. It should also be tried, as a thick interlaced screen might quickly be formed.

rous of commencing Chinchona culture; and thereafter, as many young plants of this, and other species as may be available, to applicants at the old Neilgherry rate, viz., four annas per single plant.

11. I would also suggest that a certain number, say 200 of each of the following species:—

Chinchona Succirubra,
Do. Calisaya,
Do. Micrantha,

should be carefully planted in the shola behind "Mary Ville," or other sheltered slope, and a careful record of their growth be registered.

12. The Superintendent, Mr. Hannay, is an energetic man, accustomed to an Australian life, and skilled in mechanical appliances, but without special horticultural knowledge; his attention has been sometimes diverted to forest operations, and other works, to the prejudice of his duties in the garden; the importance of propagating extensively, by layers and cuttings, should be kept in view, and for this purpose, the small experimental plantation, mentioned in paragraph 11, should be formed with great care and attention.

13. There does not appear to be any fixed establishment, the monthly expenditure at present is 184 Rupees, = Rupees 3,408 or £ 340-16-0 a year, and with the objects in view, perhaps the expenditure might be raised to £500 a year, which is the sum set aside in Ceylon. If a like sum could be sanctioned in Travancore, the services of a skilled and practical Horticulturist could be secured.

14. *Tea.*—The Neilgherry seed received in 1861 germinated freely, and there are now about seventy well formed bushes from two to four feet high in flower and fruit, 400 seedlings are available, and a large seed-bed has been prepared, and when the garden stock is sufficient, the seeds and seedlings should be distributed gratuitously, or sold at a moderate rate, such as would afford a fair profit to intending

speculators, who would establish nurseries on their own account; the primary object being to disseminate selected seeds from the best grown varieties to all desirous of cultivating Tea. The Neilgherry rates of one Rupee per pound of seed, and 10 Rupees per 1,000 seedlings might be adopted.

15. With regard to the quality of Travancore tea, nothing definite can be said until the leaf has been subjected to skilful manipulation; but it may be mentioned that Mr. Liddell of Binny & Co. has shown me reports from professional Brokers of London and Calcutta valuing Tea, grown at Charter's Hope, in the Ariangole Pass (elevation 1,200 feet) at four shillings per pound.

16. It appears to be highly probable that this part of Travancore is well suitted for Tea culture, and therefore at least four acres of the Government garden should be planted with Tea, to furnish seed of the best quality, as much disappointment has been experienced by Mr. Hannay and several of the planters in attempting to raise seed imported from Assam and the North-West Provinces, the vitality of which had been lost in transit.

17. *Coffee Nurseries* have been prepared on all the estates, so that unless it be for the convenience of planters, or for the self-maintenance of the garden, the Coffee shrub need not be propagated.

18. *Vanilla.*—It seems doubtful whether this plant will thrive at Peermade, it has been grown, but has not flowered. Further experiments in sheltered sites are required, as the commercial value of the pod is great, with an increasing trade in Ceylon.

19. *The Tallow tree of China* (*Stillingia Sebifera*) which is cultivated in China and in the northern Provinces of India along with Tea, might also be tried, for which purpose a few fresh seeds have been sent to Mr. Hannay. The varnish tree of China (*Elæococcus vernicifera*) might also be tried.

20. *Vegetables.*—Potatoes, Onions, and other kitchen vegetables, and Rhubarb might be grown to any extent for the supply of Quilon, Alleppy, Cochin, and Trevandrum. Potatoes are sold at Ootacamund at 1½ Rupees per maund, but are not delivered at Travandrum for less than 3 Rupees, and the supply is irregular.

21. *Fruits.*—Apples, Pears, and Grapes have been tried, but do not thrive on the crest of the Ghats. In some of the valleys, Oranges would do well; Raspberries and Strawberries were in fruit at the time of my visit. The Mangostein has ripened at Courtallum, and might succeed here in a well selected site.

22. SUMMARY.—To recapitulate, it seems desirable that attention should be specially given to the careful cultivation of Chinchona and Tea; extensive seedbeds should be formed, and ten acres of the former and four of the latter might be planted out. This would probably be sufficient to keep the Chinchona nurseries amply supplied, and to furnish fresh Tea seeds and seedlings for a fair extent of cultivation. Vanilla, Potatoes, and other products mentioned, should receive due care from the Superintendent. Cotton does not appear to thrive, and might be excluded for the present.

23. *Superintendent.*—Having been requested to suggest the means best calculated to increase the utility of the garden, I have no hesitation in recommending that a skilled Superintendent be procured from one of the best gardens in Europe, on a salary of (say) 150 Rupees a month with a residence. The object in view is to improve the culture of indigenous productions, at the same time to naturalize Chinchona, Tea, and other useful exotics, and to prepare both for distribution to the other settlements in these beautiful hills and plains. For this, horticultural skill and ability are essential requirements, meanwhile Mr. Hannay (whose services might be transferred to another department) should with a trained native gardener propagate Chinchona and Tea to the best of his ability.

The following are the principal trees found in the Sholas adjoining Peermade, observed during a hasty excursion.

No.	English names.	Native names.	Bota nicalnames.
1	... ...	Palmaram.	*Bassia elliptica* (Dalzell) or *Isonandra accuminata.*
2	Iron wood,	Nauga,	*Mesua ferrea.*
3	Anjelie,	Angill, ayence,	*Artocarpus hirsuta,*
4	Sack tree,	Araya anjelly,	*Antiaris saccidora.*
5	Gamboge,	Mukki, ...	*Garcinia pictoria.*
6	... ...	... ...	——— *Kydii.*
7	Rose apple,	... ...	*Jambosa Munronii.*
8	Indian plum,	Narvelli,	*Syzygium.*
9	Wild Cinnamon.	Darchini,	*Cinnamomum iners.*
10	... ...	... ...	*Litsoa Zeylanica.*
11	... ...	... ...	*Machilus macrantha.*
12	Black dammer...	Congiliam maram,	*Canarium strictum.*
13	... ...	Vellay naga,	*Conocarpus latifolius.*
14	... ...	... ...	*Elæocarpus serratus.*
15	Black wood,	Eti-maram,	*Dalbergia latifolia.*
16	Ben-teak,	Ben-terk,	*Lagerstremia microcarpa.*

Nos. 2, 3, 11, 13, 14, 15, and 16 yield excellent timber; Black-wood is found sparingly in the western but abundantly on the eastern slopes.

Among the shrubs and herbaceous plants which especially attracted notice were the following :—

Melastoma, Torenia cordifolia (Sispara creeper)—*Osbeckia, Cæsilpinia* (two species.)—*Urena, Crotalaria* (two kinds) *Solanum giganteum, Exacum bicolor* (Chiretta)-*Erigeron* (Coffee weed) *Ophelia* (var.)—*Blumea, Andrographis paniculata* (Creyat)—*Smithia, Impatiens* (several species) and of the Scitamineous tribe, there are wild Cardamom, Ginger, Zedoary, *Hedychium* and *Phrynium dichotomum.*

IX.—*Remarks on the acclimatization of seeds of various European vegetables and flowers. By Dr.* E. BONAVIA.

Allow me to bring to your notice the remarks printed in the Agricultural and Horticultural Society of Oudh's report for 1865 on acclimatization. Your Council may perhaps think them worthy of being published in your Journal. They treat of an important subject and I think they should be widely known.

I shall send you a packet of each kind of our acclimatized seeds for trial and shall be much obliged if you will kindly ask those persons to whom you distribute them to give you a small report on the result of their trials with our acclimatized seeds. But they must give them a fair trial, that is give them the *proper* conditions for luxuriance. People in India are in the habit of treating acclimatized seeds like so much rubbish. They little think that the so much prized double *Zinnia* has had its birth in India.

Acclimatization.—I must now enter to some length on a most important subject; viz. Acclimatization.

I had been trying steadily for three years to get the various European vegetables to seed. The only vegetables that usually seed are Tomatoes, Peas, Cauliflowers, Artichokes and Lettuce. Cabbages, Knolekoles, Carrots, Beet and Spinach, I could not get to seed; but in 1864, either because the soil had been regularly manured and worked for four years, or because there was some undetected peculiarity in the climate of that season, I was astonished to see so many European vegetables produce seed.

Knolekoles, Cabbages, Spinach and four varieties of Carrots seeded. Celery I had succeeded in seeding the previous year.

I got the seeds of the vegetables carefully collected and sown again in the cold season of 1865.

The acclimatized Knolekole seed germinated very well, and the generality of the plants were as good as those from newly imported American seeds. They all seeded again. By selecting the best, I shall have a considerable amount of good seed for propagation next year.

Of the acclimatized Cabbage seed, I had only a small quantity, out of which 21 seeds germinated. When the plants were full grown, I showed them to various persons, and they could not distinguish them from the best American Cabbages. They were as hard, and as perfect, as any I have yet seen. They all seeded.

The Carrot seeds of all varieties germinated remarkably well, and produced good and true roots. They all seeded without difficulty.

Of the Spinach seed, I had a very small quantity. It germinated too, but unfortunately all the plants were males.

A plant of the white Beet went to seed in 1865, but as it was late in the season, the seeds did not come to maturity.

We shall have in a year or two the following acclimatized European vegetable seeds in sufficient numbers to supply any demands which are likely to be made on us, viz:—

Good varieties of Peas, including the remarkable "Tom thumb" variety.

Tomatoes.

Lettuce, four very good and true varieties.

Carrots, four good varieties.

Knolekole.

Cabbage.

Celery.

White and red Beet, vegetable Marrow and curled Parsley still defy my perseverance. Of Brussels sprouts, we can never hope to produce good acclimatized seed. Even in England and America, all the sprouts grown are from *imported* seeds.

Cauliflower is grown in great abundance by native growers and we can always select any number from their fields for our purposes. Regarding these acclimatized seeds, there is one consideration upon which I have not touched, and which is of some importance. It is this: Residents in India maintain that European seeds, both flower and vegetable, *degenerate by acclimatization.*

Is this a fact, or is it one of those errors transmitted from generation to generation without any one caring to take the trouble to verify whether what is said be true or not?

It is in my opinion a prejudice so widely spread, and so deeply engrained in the minds of the residents of India, which if I succeed in undermining and demolishing, I shall consider that I shall have done a service to this country. It is the greatest obstacle to success in acclimatization, and is due to ignorance of the intimate laws which govern variation in all organisms, whether they be those of seaweeds or oaks, or whether those which form spiders or philosophers. There is connected with it a principle of nature which one cannot learn too soon, and which the earlier we grasp, the more quickly we shall be able to cast off that prejudice which lies like a nightmare on our minds, and which hinders us from even *trying* to do something for the better of this unfortunate country. Some time ago, I set myself the task of first proving to myself and then to others that it is an error.

If a plant germinates, grows well, and seeds, there is no sensible reason, why it should not be improved in this country as well as anywhere else, provided the conditions of healthy and luxuriant growth are invariably given.

I shall first mention my acclimatized prize Celery seed. In 1863, I got some plants from newly imported seed to go into seed.

In 1864, the acclimatized seed from those plants germinated remarkably well. In that season, strange to say, the Celery from acclimatized seed gained the 1st prize at the Horticultural Show, although it competed with many others from newly imported seed.

In 1865, the Celery from the same acclimatized seed (being now the 3rd year after importation) again got the 1st prize at the show of that year ! With regard to flavor, all those who tried it stated that it was the best they tasted in India. Next year, Members will have the opportunity of testing whether what I say be true or not, for I have not ordered any Celery seed from America, having a considerable amount of acclimatized seed for distribution.

Lettuce can be made to seed without difficulty. I have 4 varieties, which after two years acclimatization, have reproduced their originals to perfection. With regard to flowers, I have stronger proof. I began by cultivating some poppies of the species "*Papaver rhœas*" and was astonished to see every year a number of new varieties making their appearance and the flowers improving with regard to doubleness. I ordered a selection to be made every year, and the result has been that last year, I had a splendid collection of the most double poppies I ever saw.

With a little care in cultivation and selection for seed these can be prevented from *degenerating* without any difficulty.

Hollyhock.—I commenced two years ago with some semi-double *pink* ones. Last year I had many varieties out of the one kind of seed, and this season I had all the varieties that one could wish for from white to prune color, and many of them as double as they are in Europe.

Verbena.—Last year I had a small number of varieties, this year from the seeds of those plants, I got a large number of exquisite varieties.

Double Indian Pink.—This was some seed which was imported from America last year. The varieties were not many nor were the flowers large and very double. I was surprized to find how a little cultivation this year produced much finer flowers, more double, and more beautiful varieties.

Clarkia.—Out of the ordinary single pink Clarkia, this year a fine double variety was produced. I have never yet met with a *double* Clarkia even in the European catalogues of seeds.

For any one to talk of degeneration of seeds in this country by acclimatization with the evidence which I have adduced of the contrary, is simple nonsense.

Then how is it that this error has crept into people's minds? There must have been some foundation for it. Yes there has been and a very good one.

There is a principle which we would do well to learn at once; that is, it is *impossible* for all the seeds of a plant to produce their respective plants exactly like each other, or in other words, every individual plant is a variation; but very often the amount of variation is so slight that it is not detected, and it may require a great number of generations to make it apparent. On the contrary sometimes a great degree of variation takes place in one generation.

Why is it impossible for all the seeds produced by one flower to develope plants exactly alike?

1*st.*—As regards the seeds, no two seeds occupy the *same* place in the seed vessels, and no two seed vessels occupy the same place on the plant, consequently no two seeds can be exactly under the same conditions of nourishment &c, during their developement on the same plant. This microscopic amount of difference in the embryo, is ample to account for differences in the mature plant which eventually comes from such seed.

2*nd.*—Granted this tendency in the seeds, it is next to impossible when they are sown, that they be all placed exactly under similar conditions of soil nourishment, of moisture, of air, heat, light &c. All these microscopic differences of external conditions in addition to the inherent differences in the seed, will, in many kinds of plants, produce a tangible variation in one generation.

The marvel is, that so many plants, generation after generation, continue to resemble each other, which shows that the tendency to inherit qualities from parents is very great in spite of all disturbances, althought at present we know nothing of the laws of inheritance, but the bare fact that such a tendency *does* exist.

The most ordinary kinds of degeneration of which people complain with regard to flowers in this country is

1*st.*—Flowers originally double. by acclimatization eventually become single.

I have no hesitation in saying at once, that when this occurs, the fault is neither in the seed, nor in the climate, but in the gardener. There is little doubt that doubleness depends on luxuriance, and the tendency of a plant is to transmit that quality to its descendants, so that if the climate admit of the growth of the plant at all, luxuriance and doubleness are in the hands of the grower.

2nd.—Flowers originally of brilliant colors, by acclimatization lose their brillancy, and become all of one ordinary color. This is very easily explained. The seeds when first imported are sown in beds near each other, or in pots kept close to each other, all varieties of one species as a matter of course fertilize each other, and the seed of all colors is collected in one packet. This miscellaneously colored and fertilized seed is sown in one bed the next year. Some of the flowers resemble the originals and the majority are of a mixed or diluted color. The latter by their numbers produce a vast amount of cross fertilization, and thus every year the colors are more and more diluted till eventually they become what is improperly called *degenerated.*

This degeneration under similar circumstances will occur, not only in India, but in any part of Europe, or any part of the world ; and can only be counteracted by the constant care of the gardener in selecting the best and most perfect plants for seed, by keeping the plants of different colors and which are of the same species as separate as possible, and by giving the plants all the conditions requisite for luxuriance. All these apparent trifles must be attended to systematically every year.

It is not at all likely that private individuals will attend to all these requirements, and it is most unlikely that native *malees* left to themselves will ever dream of them, or attend to them when they are told; so that, if we want any progress at all, a central place, where the climate is favorable, where some one can devote his time to this subject, and where means for employing a sufficient number of men for the purpose are available, becomes a necessity.

It would be otherwise, if seeds were easily procurable from Europe and at the same time would germinate; but such is not the case. All our experience of European seeds goes to show that they rarely germinate well, whatever may be the cause of it. American seeds only are to be depended upon. But these cannot be had sufficiently cheaply to bring them within the reach of the native population; so that, although we may not completely succeed, even after acclimatization, to maintain their original qualities in such perfection to suit the delicate taste of the higher classes of Europeans, there is no argument which will release us from our obligation to endeavour to produce, through the means of acclimatization, cheap European vegetables for the use of the European troops and the native population. The production of vegetables being a necessity, in order to furnish a change of diet, all cultivation in the vicinity of cities will always be, as a matter of course, that of vegetables and not of cereals; so that we have not only to devote our attention to cereals for the benefit of Agriculturists, but also to the introduction and multiplication of vegetable seeds. That natives will use them readily, after they become fairly acquainted with them, the history of the Potato, Cauliflower, and other vegetables, furnishes sufficient evidence. Last year, several natives bought from the Society's garden young plants of Cabbages and Knolekoles at Rs. 1 per hundred. It is evident that they are willing enough to cultivate the better sorts of vegetables provided they can get the seeds easily and cheaply.

One efficient way of inducing natives to change their old fashioned habits, is to make them by degrees accustomed to better articles of food than those they have been in the habit of using from generation to generation; once they have tried better things, a feeling of dissatisfaction will be engendered in them on returning to their old articles of food, and thus a power will be gradually developed in them which will continually urge them to better themselves.

Manure.—Several years' experience in gardening in this country has taught me that there is no manure equal to *night soil.* It produces richness of color in flowers, and vigor and succulence in vegetables.

The Chinese, who are considered to be the best gardeners in the world use nothing else. In China they understand the office of manure so well, that every man who brings vegetables, or fruit, &c., into the market from his fields in the morning, returns to them in the evening with a load of night soil. They never sow a crop without first manuring the ground. The ruin of India is the usage of manure materials for fuel. It is simply burning so much gold annually, or better, so much material easily convertible into food. What is the reason of it? Scarcity of wood for fuel is one of the great reasons.

The planting of trees ought to be the incessant care of the Government. While wood fuel is scarce, there is no possibility of diverting the manure materials from the fire to the earth. It is a subject of such importance, that planting of trees deserves special legislation for the purpose of securing the planting of a young tree somewhere, in lieu of every old one that is cut down. The vitality of India will depend in a great measure on its amount of fuel. Let us just consider, in addition to the original scarcity of fuel, what an increased consumption, even the comparatively small number of railways has caused. Men multiply rapidly, but they are not able to increase the productions of the earth on which they feed in a proprotion to keep up with the rapid increase of demand. Let us, under these circumstances, only think for a moment of the immense importance of the vast amount of material easily convertible into food, which is instead, for want of cheap fuel, devoted to the fire. If we could only feel the seriousness of this subject, we would be more in earnest about our work. If we do not make a beginning we shall never come to any conclusion. The Lumberdar, or head of each village, might be made responsible for the annual planting of a certain number of trees in his village, and to see that no old tree is cut down without the planting of a young one in lieu of it. This rule would not in the least interfere with the prejudices of the natives, and they would soon learn to see that it is for their good.*

THE GARDENERS NOTE BOOK, No. 8.

X.—*Propagation and cultivation of the Malta Orange and Lemon.*

By Dr. E. BONAVIA.

I enclose a copy of the mode I use for propagating and cultivating the Malta Orange and Lemon. As the introduction of these fruit trees is now an established fact and only time is required to disseminate them all over India, where there cultivation is admissible, you may perhaps think it useful to publish it in your Journal so as to make the method widely known.

Sow seeds of the common country sour orange, called by natives "khattà", about three or four inches apart in a bed prepared by proper digging and manuring, as soon as the fruit is sufficiently ripe, which occurs about the end of the rainy season. At the commencement of the ensuing rains, transplant the seedlings with a ball of earth about 9 inches apart, and if possible re-transplant them about the beginning of the next winter in properly prepared beds about 12 inches apart. The object of these various transplantings is not only to give more space to each plant, but to cut their roots and reduce them to a small compass, so that when the stocks are budded and ultimately transplanted to the places where they are to remain, they will scarcely suffer by the operation, as the roots will only be a mass of small fibres something like the head of a mop, and included within about the same space.

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* A suggestion somewhat similar to this was made many years ago in respect to the Azimghur district, by the then Collector Mr. H. Tucker. Full particulars will be found in the Eighth Volume of the Transactions.—EDS.

The side shoots of the sour orange seedlings should be pruned off from time to time, in order to enable the stock to grow in length and thickness.

The February and March following the last transplanting of the stocks is the best time for budding. By that time, they will have attained the height of about 2 feet, and will be about ½ an inch in diameter in the thickest part. Very few of those budded in February will fail, and by the next rains, the buds will have grown into shoots from 1½ to 3 feet, when they can be transplanted into their final places.

The budding of oranges in Europe is generally done by the cross cut thus **T**, but I have not found this mode answer so successfully as the ordinary native mode. The angles of the detached bark formed by the two cuts, shrink and allow the engrafted bud to dry. The native method is very simple and very successful, and it is the one also used for budding roses, viz: by a single longitudinal cut about an inch long through the bark down to the wood.

In the months of February and March, all orange buds become active, and there is a good deal of sap beneath the bark, so that the latter is easily separated from the wood.

From healthy and fruitful orange or lemon trees, and which you wish to propagate, select round cuttings, the buds of these being much better, and more easily separated from the wood than of such cuttings as are flat or angular. Select the middle part of the shoot, in preference to the base or extremity, as it furnishes the best buds.

The buds are always found in the axillæ of the leaves, that is, in the angle formed by the petiole* of the leaf and the stem. In places where the leaf has dropped off, the eye or bud will be found immediately above those places. Cut off the leaves from the cutting, by dividing the petiole about half an inch from the stem, make a horizontal cut down to the wood, with a round pointed and sharp penknife, or budding knife, about a quarter of an inch or a little more above a bud, and a similar cut about the same distance below it; then make a longitudinal cut on each side of, and about a quarter of an inch from the bud, so that the bud and the portion of petiole attached may be in the middle of the four cuts. By putting the edge of the knife under one of the side cuts, the shield of bark with its eye can be easily lifted off the wood. Proceed in the same way with all the buds of the cutting, and as you separate them, place them in a little *clean* water in a saucer or such other vessel, or wrap them up in a piece of moist cloth to prevent them from drying before they are engrafted. The buds are engrafted in the following way: on the north side of the stock, this being the most shady part of it, make a longitudinal incision about an inch long, down to the wood, and about 9 inches or so from the ground. Bend the stock towards you, so that the incision may be at the bottom of the curve. By so doing, the edges of the incision can be lifted from the wood with the greatest ease by means of the point of the knife, or the edge of the handle of a budding knife. When the incision is gaping, take hold of a shield to be engrafted by the portion of petiole attached, and introduce it under the edges of the incision in such a way, that the hollow part of the shield may adapt itself to the curve of the wood of the stock, and the bud be, with regard to the petiole, in the same position as it occupied on the cutting. This operation done, which practice will enable you to perform neatly, straighten the stock, and the flaps of the incision will close tightly on the shield, leaving the bud and bit of petiole between them. All that remains to be done now is to twist a thin strip of dry plantain or palm leaf, previously wetted, above and below the bud, so as to keep the flaps in close contact with the shield, and to shelter the incision from the drying effects of the air. It is well to nip off the top of the stock to concentrate the organized sap on the sides where the stranger bud has been engrafted. In about a week or so, if the budding is to succeed, the shield will be stil green, and the bit of petiole attached to it will drop off on being touched, which is a good sign. If the budding fail, the shield will have dried before the week is over. Prevent all other buds, except the stranger one, from developing on the stock. As soon as the engrafted bud begins to grow and is about one inch or so long, divide the stock by a clean cut about one inch and a half above the graft. By the ensuing rains, the graft will have grown into a shoot or shoots, from one to three feet long.

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* The petiole is that part of the leaf which unites the blade of the leaf to the stem.

Wherever the tree is to be afterwards, when the rains have well set in, prepare a hole 3 feet or so wide, by 3 feet deep. Mix at the bottom of it a quantity of rotten night soil and good earth, and plant the young tree, carefully taken from the nursery with a good sized ball of earth enclosing its roots. Shade for a few days if necessary, and water every day till the tree takes root. Afterwards water freely whenever necessary. Each tree should have a good top dressing of rotten night soil every rainy season.

The orange trees had better be screened from the hot winds during their first year. During the hot months they must not be allowed to suffer from *want* of water. The trees ought not to be allowed to bear fruit for the first two years, as it will interfere with their rapid growth.

XI.—*Report of experiments made in the Moorshedabad Zillah (Bengal) on the eggs of the Japan Silk-worm, in the Spring of* 1866.—*By* F. LAGARDE ESQ.

Owing to the success of Japan silk worms in France and Italy of late years, some proprietors of silk filatures in Bengal thought it advisable to try whether Japan silk worms could be acclimatized in this country where the indigenous silk-worms produce cocoons inferior in quality to those of any other silk producing country.

Some boxes of Japan silk-worm's eggs were consequently brought to Calcutta in the beginning of this year out of which I procured six boxes, marked S. W. E. $\$\ \frac{1}{3}$ and $\frac{11}{13}$. Their contents were supposed to be eggs of two different species, bivoltin (giving two silk crops in the year) and polyvoltin (giving more than two crops in the year.) Each box contained five hundred cards measuring fourteen by nine inches; the eggs were strongly adherent on one side of these cards. Great care seems to have been taken in the packing. The cards were separated 10 by 10 by wooden partitions which however proved insufficient as they were almost all broken and the cards of the whole box pressed too heavily on one another. The inner box of very thin planks was hermetically shut up in one of tin which again was covered with another plank box. It is the opinion of many competent-judges of this subject in France that it is a mistake to shut up the eggs hermetically. The boxes ought to be on the contrary well perforated to let the air circulate freely inside. It may be on account of this mistake as well as on account of the long stay of these boxes in Calcutta, under the influence of an atmosphere too warm and too dry, that the eggs came to us in a very impaired condition.

On opening my boxes, I found that in one of them a certain quantity of the eggs had hatched. Half the number of the young worms were alive; the others being already dead it is clear that they had hatched several days before their arrival in Berhampore, since young worms can live ab[illegible] three days without food. The worms ought to have come out altogether at the same time, and if such was not the case it must be attributed either to the irregular preparation of the eggs in Japan, or to the unfavourable circumstances under which they came to us. I am inclined to believe that the eggs were injured by being hermetically shut during their transport from Japan to Bengal, and that the air in the boxes being unchanged and dry, the weaker worms were asphyxiated or starved in their shells; the stronger ones were alone able to burst through before we opened the boxes and very likely were those that came out first and were found dead in great number.

My six boxes arrived on the 12th February and were distributed to native silk-worm rearers of different parts of this district. On the next day I kept for my own experiments two cards of the boxes No. 1 and No. 13. At first I found it very difficult to induce the natives to take the eggs, so strong is their prejudice against anything that is not exactly according to their old "dustoor." When afterwards it was reported among them that my two cards were promising well, the remaining ones were very readily taken away.

On the fourteenth of February my two cards were placed in a hatching apparatus made in France and brought out here in 1860 for similar experiments on Cashmere silk-worms; which by the bye proved a failure though the eggs had arrived in a very good state.

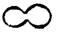
The next day, with a temperature of 69° Fah: (16/½ Réar:) in the apparatus, some worms came out. On the 16th their number increased considerably. The hatching went on till the 24th very irregularly under the influence of a temperature that had been gradually raised to 83° Fah: (22° Rr). Had I thought of correcting the dryness of the atmosphere by the evaporisation of water near the hatching apparatus, I believe that all the worms that were not asphyxiated or starved when the boxes were opened, would have come out, while owing to the dryness and consequently to the hardness of their shells, many could not burst through in their weak state, brought on by the unfavourable causes above mentioned.

Out of one card about 15 per cent. of the eggs hatched and nearly 40 per cent. out of the other. The cards distributed to the native rearers gave still less satisfactory results; the average proportion of their hatchings being estimated at 7 per cent. only.

Now let us see what became of those young worms that were able to go through such trying circumstances without perishing. They would I believe have thriven excellently, had their antecedents not been so prejudicial to their health, but as it was, they must have been in a debilitated state or disposed to such, at the time when good care began to be taken of them.

They had good appetites, soon became lively and grew very fast. I was beginning to expect a good result from them when a deadly enemy made its appearnce *viz.* the large blue fly that deposits on the worms its larvæ which destroy them in a short time. Sufficient precautions had not been taken against these flies and nearly half of the worms were destroyed by them.

Such as were spared began to make their cocoons in a temperature of 84° Fah: 30 days after the day they were hatched (some 28 days and some 32).

The cocoons were white, generally small, compressed in the centre thus . Nearly 10 per cent. of them were very hard and much larger than the others; they were double cocoons *i. e.* they contained two chrysallis instead of one. A few contained three and even four chrysallis. This was the first sign that made me believe that they were "polyvoltin," as in France the large proportion of double cocoons given by the polyvoltin-species had always been complained of. Those double cocoons were reeled off apart but their produce was very bad and not to be taken into account. As the first cocoons were being made I remarked the tendency of the worms to go two inside the same cocoon, and in order to prevent them from doing so I had special mat boards (Chunderkees) made for them, with narrow cases, in which the worms were placed in such a way that they could not come much in contact with their neighbours and had to make their cocoons singly. The native rearers had no time to take the same precaution though their worms were hatched and made their cocoons several days after those which I had, and their proportion of double cocoons was 35 per cent. This however did not surprise me as polyvoltin Japan worms have given as much as 40 per cent. of double cocoons in France.

The best of the cocoons of my Japanese silk-worms were reeled off after having been selected and put apart. Their produce was one chittack of silk per 1120 cocoons, but the average quality of the cocoons obtained from the worms by the natives was greatly inferior to this. In fact we may say that the average of our Japan cocoons was very bad. For instance, one chittack of fresh cocoons contained 58 in number and 1840 of them gave only one chittack of silk; their produce was then, at the rate of 29,440 cocoons (23 cahans) to a seer of silk. This corresponds to 31 kilogrammes of cocoons per kilogramme of silk. So bad as it is, it is not worse than the result of the last crop of the polyvoltin in France. The hatching there was a little better than here, probably on account of the experience of previous years, but the quality of the cocoons is said to be just as bad.

The same kind of eggs, and packed in the same way, must have been forwarded to Europe in enormous quantity and been sent to Calcutta for our experiments on a small scale, and as they reached the rearers in the same bad condition they gave the same result in Europe and in this country.

Though our Japan cocoons were inferior in produce to our indigenous ones, we spun from them a silk much superior to Bengal silk in brilliancy and cleanliness.

Out of the 3,000 cards of eggs that I received I obtained something less than two maunds of silk. This very unsatisfactory produce of our cocoons of Japan worms is perhaps also to be attributed to our ignorance of the peculiar *modus operandi* required by these cocoons for their good spinning in the filature. Now I think ~~that~~ they yield more silk when spun as soon as possible after they have been made for they require then very little steaming in the preparatory oven. When dry and old, they require much steaming and even with that precaution yield little silk.

I kept a small quantity of cocoons for new eggs which were laid on the 30th March and which hatched almost immediately after in a very simultaneous manner. The young worms were reared and promised well, but soon began to get weak. Their cocoons were even inferior to the first obtained. However I kept a few of these second cocoons merely to see when they would hatch. They also hatched almost immediately, but their worms were so sickly that we threw them away. It was then evident that we had had to deal with polyvoltin silk-worms. I did not attempt to cross them with any one of indigenous species as very little reliance could have been placed in the results of any experiments on such a debilitated stock.

This first attempt, I regret to say, has been a failure, still we must not give up so soon the hope of introducing in this country a better silk-worm than the "chota polo" and the "nisteree." There are I believe three well distinct species of silk-worms in Japan *viz :*

The white cocoon annual silk-worm.

The yellow annual cocoon; and the polyvoltin, some of which give white cocoons and some yellow and also green cocoons.

The two first species called "annual," because they give only one crop in the year, produce very fine cocoons and belong mostly to the mountainous parts of Japan. They have succeeded the best in Europe.

The polyvoltin are called thus because they give several crops in the year; some give two crops and accordingly are called "bivoltin," some three crops and are called "trivoltin." All those giving more than three crops are called polyvoltin and share with the bivoltin and trivoltin a bad reputation in Europe, for their result there. They ought to suit this country very well for we have mulberry leaf ready all the year round in Bengal. The bad quality of their cocoons stands against them, but we might perhaps get good polyvoltin cocoons if we could procure healthy, well prepared and well packed eggs from Japan.

I would recommend at the same time the importation of specimens of the annual Japanese white and yellow cocoon silk worms. Experience has proved that in most cases of crossing silk worms of different species the number of crops given by the breed that is formed by the crossing, is determined by the mother's species while the quality of the cocoon is more like that of the cocoons of the father's side. If this be true we should have a fair chance of forming a polyvoltin breed producing good cocoons.

It might also be good to procure some eggs of Chinese silk worm.

The best time for our experiments is the beginning of the cold weather during our bund of November. The eggs ought to arrive in Calcutta in the beginning of November to be distributed immediately.

A new obstacle stands now against these experiments: the natives will not easily be persuaded again to experimentalize after witnessing the failure of the first attempt. Feeding silk worms upon dear mulberry, with the risk of getting no cocoons to pay back the outlay will appear to them a dangerous speculation. Could not the Government of Bengal help these experiments by granting some allowance to defray part of the expenses of such experiments which, if successful, would add so much wealth to the silk districts of Bengal?

[Mr. Lagarde forwarded a small skein of silk with the above paper, which has been reported on by a Member of the Silk Committee, Mr. E. G. Buskin, as follows:—

"Good color and quality, even, clean thread, and well reeled, size 12 to 15 deniers, a very desirable silk, and as good as any produced in Bengal. Present value about Rs. 21 to 22 per factory seer."]

XII.—*Observations on the germination and growth of Seeds of the Medicinal Chinchonas.*—*By* W. G. McIvor, Esq., *Superintendent Government Chinchona Plantations.*

(Communicated by Dr. Cleghorn.)

1. The conditions required to produce germination in all seeds are moisture, heat, and air. Moisture must be supplied, but not in an unlimited quantity, or the seeds will rot, as is the case with seeds when sown in too damp a soil, because the power of respiration in the seed is impeded by the excess of water, and it is unable to decompose the quantity of water it absorbs, which collects in the seed and becomes putrid. There must, therefore, be some water, but not too much; and it is generally considered that a mixture of sand and loam is the best soil in which to raise seeds, because the sand keeps the loam from adhering together when watered, and this allows the excess of water to pass through (or drain off,) while the loam, by the force of attraction, retains as much water among the cavities of the soil as is required for the purposes of germination; clay or clay loam retains too much moisture, and seeds sown in such soils are sure to rot. The quantity of moisture must not be too great, and it must be uniform also, that is, the seed-beds must not be soaked with water one day and the next allowed to become dry, because the changes the seeds undergo in germination must take place without interruption, or the seeds will die. To preserve uniformity in this respect, great care is required, especially with Chinchona seeds, as these must be grown either in a glass-house or under thatched (pandalls) hurdles, placed in a sloping direction over the seedbeds, so as to throw off the rain, the beds being of course

open on the sheltered side so as to admit abundance of light and air.

2. Chinchona seeds are exceedingly small and light, being smaller and more oval than the seed of the common birch, and, like it, consists merely of a wing with a minute embryo in the centre. When the seeds are fresh they should be steeped for twelve hours in water, prior to being sown, but when the seeds have been kept some time, or received from a great distance, they should be steeped for about six hours only, for although the steeping in water facilitates germination, it is, nevertheless, liable to injure old seeds, which may be sown without steeping. The most convenient way to steep the seeds is to place them loosely in a bag, and immerge the bag, together with the seeds, into a pail of water. When the seeds have been soaked the prescribed time, the bag is raised out of the pail, and the water allowed to drain off; the seeds are now turned out of the bag, and will be found to have swollen considerably, and in order to separate them, they are mixed with about twice their own bulk of dry sand, this absorbs the extra moisture around the seeds, and on being stirred up gently they separate freely, and become intermixed with the sand, in this condition they are sown on the surface of pots filled with soil, (prepared as hereafter described,) and lightly covered over with a mere sprinkling of fine sand, after sowing, the surface of the pots are slightly watered with the syringe, this watering being repeated in dry weather four or five times a day, in order to support a uniform moisture.

3. The soil we have used with most advantage in the rearing of Chinchona seeds, is composed of leaf mould, or the earth produced by rotten leaves, sifted and mixed with four times its own volume of sand. The leaf mould was, in the first instance, exposed to the sun for two or three days, and thoroughly dried; it was then heated to about 212° Fah, in order to destroy all grubs or larva of insects: after being allowed to cool, it was brought into the potting shed and watered sufficiently to make

it moist, but only to that degree of moisture that the particles of soil would not adhere together when pressed firmly with the hand, that is, the earth on being laid down was sufficiently dry to break and fall into its usual form. The leaf mould and sand in this state of moisture were mixed together, and the pots filled, the surface lightly pressed down, and the seeds sown thereon being covered with a sprinkling of sand as above described. The pots were then plunged into beds of moist sand, and just sufficient water being given to damp the surface, but never to penetrate or consolidate the soil; under this treatment the seeds began to germinate very strongly on the 16th day after sowing, continuing to germinate for about two months; one ounce of clean seeds producing on an average from 20,000 to 25,000 plants. The principal art appears to be to keep the soil in an uniform state of moisture, but never wet. The least excess of moisture causes the seeds to mould and damp off in thousands, while as a matter of course, if kept too dry, they become parched up. As soon as the seeds germinate, they are carefully pricked out into pots filled with fresh earth (prepared as above); this operation is a very delicate one, the seedlings being carefully raised with a small pointed stick out of the original seed-pot, is removed to the new pot, and planted in the soil, while the seed lobes are kept well above the surface. In this way from one to two hundred seedlings are transplanted into a nine-inch pot, and then treated in every respect the same as the seeds, that is, they are never watered heavily, the surface being merely sprinkled and the pots plunged in beds of damp sand, as before stated, to keep the soil in that medium state of moisture in which it was when first placed in the pots. The seedling pots should be exposed to free currents of air especially in moist weather. The necessity for this care is to prevent the seedlings from damping off, to which they are very liable when treated otherwise; it also greatly facilitates their growth, and the formation of roots, the earth in which they are placed being so perfectly open that it is readily affected by the action of the atmosphere, and thus kept in the most favorable condition for promoting vegetation. When treated in this way, our seedlings have made an average growth in one year of over thirty inches, while many of our seedlings which were raised and grown on a retentive soil have not attained the height of three inches in the same period. Chinchona seeds germinate best at a temperature varying from 65° to 75° Fah., they will also germinate, though slowly, at a temperature of 55° Fah., and will sustain without injury a temperature of 80° Fah., the seedlings produced at a higher temperature than this are weak and more or less unhealthy.

OOTACAMUND: *22nd June*, 1866.

JOURNAL

OF THE

Agricultural and Horticultural Society

INDIA.

I.—*The cultivation of Orchids, adapted to the climate of Calcutta.*

BY SAMUEL JENNINGS.

In publishing the following pages, which were originally written for my own guidance and information, it is necessary to observe that I do not profess that they contain many original hints or much fresh matter. Most of the rules laid down for the cultivation of the various species of Orchids have been taken from Paxton's Magazine of Botany, Dr. Lindley's valuable book, and the Proceedings of the Royal Horticultural Society of London, and adapted to this climate. The observations on the general management of Orchids are not new,—they are well known to all who have made these interesting plants a matter of study. My object in publishing these notes is to afford information to many lovers of Horticulture who have no extensive botanical library at their command, and who for want of such information either neglect the cultivation of Orchids altogether or having them, can never produce a flower;—to such are these notes addressed and not to Botanists who have other and more extensive means of profiting by the experience and learning of men who have spent their lives in acquiring it.

DUM DUM HOUSE:
1*st November*, 1866.

Cultivation of Orchids.

The study of Floriculture is essentially one of the chief delights of our countrymen and women wherever they reside. In England and the Colonies it may be carried to great perfection, but in India there are so many difficulties to contend against that it is by no means so general here as in other parts of the world. During four months of the year only is it possible to keep a garden in any thing like order, *i. e.* from November to February, and during these four months only can out-door exercise be enjoyed with comfort. In the hot weather from March to June our gardens are scorched up with intense heat, and in the rains from July to October nothing can stop the growth of the thick jungle which overruns our gravel paths in a few days; an army of Mallees can scarcely keep it down and, unless at considerable expense, our gardens instead of furnishing us with pleasure, can only be considered eyesores. This is a matter of great regret to many who would otherwise find much enjoyment from so charming and interesting a recreation.

There is however one class of plants to which but little attention has as yet been given, which from their habit and requirements are essentially adapted to supply the gap in our horticultural studies during the hot and rainy seasons. Plants known at home only in hot houses and beyond the reach of the middling classes—yielding nothing in beauty, curiosity or interest to any other members of the Vegetable Kingdom. Rare and expensive in England, they are easily obtainable in India, and with a little ordinary care and attention they may here be brought to great perfection even in a shady verandah. I refer to Orchids; and I propose, for the benefit of those who feel the deprivation I have alluded to, to offer a few remarks on the mode of treatment I have found successful in the cultivation of these beautiful plants; and I am sure if my friends will only give them a trial they will speedily agree with me that they well repay any little expense or trouble they may occasion. Their lovely colours when in bloom, the curious formation of their flowers, the profusion with which they are produced, their vigorous growth, and the refreshing green of their foliage, render them particularly attractive at all seasons of the year; but most specially as their chief beauties are displayed during the time of the greatest heat and drought, when all else is brown and withered by the hot winds and the powerful heat of the sun. Nor should I omit to mention the wonderful *variety* of shape and colour and the exquisite fragrance which many of them possess. In singularity of shape none can equal the curious *Oncidium papilio*, like a large brown and yellow butterfly which seems to flutter in the gentlest breeze over the beautiful mottled foliage of the Orchid. The *Cycnoches*, the flowers of which bear a remarkable resemblance to a white swan with its gracefully curved neck. The *Peristeria elata*, like a snow white dove with expanded wings. In variety of colour I might mention the pure whites of the *Angræcum eburneum*, *Dendrobium formosum*, and *Phalœnopsis amabilis.* The rich yellows of *Dendrobiums,—Gibsonii*, *fimbriatum*, *densiflorum* and *Cambridgeanum;* the lovely reds of *Cattleyas—Mossiæ*, *marginata* and *Skinneri;* and *Lœlia autumnalis.* The deep purples of *Cattleya labiata* and *Bletia hyacinthina*, and the delicate lavender of *Vanda cœrulea;* and almost every conceivable variety and combination of shade and colour through the innumerable species common to all tropical regions. Not many flowers can compete with advantage against some Orchids, for fragrance, as for example, *Aerides odoratum*, a single spray of which will fill a room with its exquisite scent. *Calanthe gracilis*, *Cymbidium Mastersii*, *Stanhopea Martiana* and others too numerous to mention are all deliciously fragrant.

Another advantage possessed by Orchids over other plants is the small space they occupy; a shady verandah or a light godown will suffice for a very respectable collection, a few blocks of mango wood, some shallow gumlahs and a store of moss jammah *i. e.* vitrified brick, charcoal and some leaf mould and peat, is all that will be required for starting; and I feel certain that it is only because they are not understood, that they are not in almost universal cultivation. These remarks apply to a large number of this beautiful class, although many others would probably thrive better in a conservatory or green house where the moisture can be retained in the atmosphere during the arid months of March, April and May.

I—Localities.

The districts in this part of the world where Orchids are to be found are very numerous; they grow in profusion along the southern slopes of the Himmalaya from Nepaul to Bhootan, particularly below Darjeeling where many fine varieties may be met with. Then again the valley of Assam and the Khassea Hills are particularly rich, especially the northern slopes of the Jyntea, Khassea and Naga Hills, where the celebrated *Vanda cœrulea* grows. In Bengal and the Sunderbunds not many are to be found except *Vanda Roxburghii* and *Saccolabium guttatum*. Burmah and Aracan are very rich, as are also the Tenasserim and Tavoy provinces. The Andamans, Straits, Ceylon, Java, and the Eastern isles are all full of fine plants, so that should my readers have friends in any of these places, it will be well for them to endeavour to obtain collections, for they are most easily transmitted from place to place.

II—Gathering and packing.

The best time for collecting Orchids is during their season of rest, before they begin to start into growth. They will mostly be found attached to the branches of large trees in the dense shade of the Forest where moss grows in abundance, also on stones and rocks. Terrestrial Orchids must be looked for near the trunks of prostrate decayed trees in rich light vegetable soil particularly near a running stream or waterfall.

There are several ways of packing, but as far as my experience goes I think the best is in. dry moss. Plants gathered in the cold weather when at rest should be at once packed and sent off. If collected after their growth has begun they should be dried for a few days in the sun previous to packing lest the moisture which remains in them should cause rot when confined in a box or basket. I have received several good collections in open baskets which have been kept during their passage in a cool and airy place; but when such arrangements cannot be made it is best to pack them in a box well lined with dry moss and a layer of moss between each layer of plants and the whole nailed down tight; but one thing must be specially cared for, both plants and moss must be as free from moisture as possible. Some fine collections which were sent me from England, packed with wood shavings, have reached me after a six weeks' journey in excellent condition.

III.—Treatment on arrival.

Upon arrival unpack the plants with as little delay as possible and range them on the floor of a well-sheltered and almost dark shed, sprinkle them with water and gradually accustom them to bear the full light again. I once lost several fine plants through ignorance of this important rule; having been at once brought from a dark box into the full glare of daylight the shock was too severe and they perished. "*Experientia docet.*" It may be that insects have been produced in the box, these should be carefully destroyed. Cockroaches, Woodlice, Scale and Ants are very destructive, and whenever a plant seems infested with them measures should at once be taken for their destruction. As a whole I think Orchids are far less liable to such attacks than any other class of plant.

The collection is now ready to be finally disposed of, as it is intended that the plants shall grow, all dead roots should be carefully cut away with a pair of scissors and the whole plant well washed with soap and water.

Some Orchids are grown on mango-wood stumps of suitable sizes, the roots protected with moss, or if that is not obtainable the husk or fibre of cocoanut, and the whole firmly bound with copper wire; others flourish best in open work baskets, filled with burnt brick, charcoal, bark, and moss; others again do admirably in flower pots, with a soil of rich turfy peat, loam, leaf mould and charcoal, according to the habit and nature of the plant. Drainage is a most important matter, as whenever water is allowed to accumulate near the roots the plant is sure to rot; large lumps of *Jammah* or charcoal are the best to secure a free passage for the water through the soil.

As a rule when potting Orchids, the bulb of the plant should be above the rim of the pot, and the whole covered up with moss, and smaller lumps of *Jammah* to keep it in place.

IV.—General Management.

As a rule, Orchids have three stages of growth. 1st. the flowering season; 2nd. the growing season, and 3rd. the season of rest; and each stage requires its own peculiar treatment. When at rest but little water should be supplied and the plants should be kept as cool as possible. Bulbous Orchids should only have enough water to prevent the bulbs from shrivelling. Once a week, and that sparingly, will in most cases be found to be enough. About the end of February, signs of life will appear; this should be the signal for gradually increasing the supply of moisture, at first twice a week, and then daily until the flowerbuds begin to expand. Up to this point, syringing the whole plant will be the best mode of watering, but as the delicate beauty of the flowers is greatly impaired by contact with water, and their decay is always hastened if care is not taken, the syringing should be stopped and water applied at the roots only, wiping the leaves carefully with a damp sponge. When the flowering is over copious moisture should be supplied to promote free growth of fresh shoots and bulbs, which will immediately make their appearance. Care must be taken after each watering to see that no moisture is allowed to settle on the young shoots and leaves, as it will very probably cause rot which is most destructive and difficult to stop, a sponge is the best thing to remove superfluous water from leaves, &c. About the end of September begin gradually to withhold moisture until the plant has fairly settled down to rest which will be about December. The condition of the plant will always indicate whether too much or not enough water is given.

In India it is a very common practice to water plants from earthenware gumlahs and tubs, in which the water has perhaps been standing for some time. This I believe to be injurious to Orchids and other tender plants as the temperature of such water will be several degree below that of the atmosphere and will give the plants a sudden chill which is productive of harm; my practice has always been to add hot water until the thermometer indicates a temperature a trifle above that of the surrounding air; the results have been much to the benefit of the plants which have invariably made stronger and more vigorous growth.

Almost all Indian Orchids flower in April, May and June; some of the American varieties, on the contrary, come into bloom at the end of the year, in August, September and October; *Cœlogynes* flower in December and January.

As much of the beauty of the plant depends upon the condition of the leaves it is impossible to bestow too much care on them, not a speck of dust should be allowed to sully them. Frequent sponging with soap and water, both the upper and under surfaces, will wonderfully improve their appearance and render them better able to perform their natural functions. Drops of water should never be permitted to remain upon them, for should the sun's rays accidentally rest on the plant, an ugly burnt hole will be the certain consequence, which would greatly detract from its general appearance.

It has been remarked that the time when copious watering and atmospheric moisture is required is precisely that period when, in Calcutta, the air is scorched and dry, and in this fact lies a great deal of the difficulty hitherto experienced in keeping Orchids healthy during the burning months of April, May and June.. The compost in which Orchids are planted being so open and free, the water of course runs through and but little is retained in the pot, and that little is almost immediately evaporated by the dry heat of the surrounding atmosphere.

The great object of the cultivator at this time is therefore to supply constant atmospheric moisture. In a glass conservatory this is easily done, but elsewhere it is almost impossible. The best plan is to place the Orchids in a well protected shed, and spread the floor with the refuse of tan-pits to the depth of say three inches, and water the whole twice or three times a day. Tan is peculiarly retentive of moisture and a constant evaporation will thus be kept up, very much to the benefit of the Orchids.

In a conservatory it is not so difficult to keep up this necessary moisture, tan may be used with advantage and in addition *cus-cus* tatties may be fixed to moveable frames on the door way and kept wetted, these will answer the double purpose of cooling the house and saturating it with refreshing moisture.

Temperature is a most important matter for the consideration of a careful Orchid cultivator and his object will not be to increase the heat as it would be in England, but to reduce it as much as possible in the hot weather. A temperature above 95° is injurious to East Indian Orchids, whilst American plants can scarcely tolerate a greater heat than 80 to 85°. This is a serious difficulty in the way of the successful cultivation of the lovely *Cattleyas*, *Lælias*, *Stanhopeas* &c., &c., of Brazil and the West Indies. During the severe heat of last May, (1866) for three weeks the thermometer in the shade registered from 103° to 107°. In my glass-house by the help of cus-cus tatties, it seldom rose over 98° and to this I attribute the present health of my Cattleyas and many other valuable exotic Orchids which otherwise must have perished. This heat was however quite exceptional and I think it possible under ordinary circumstaces to keep the temperature as low as 90° in the hot weather in Calcutta.

It is a good rule never to divide an Orchid except when absolutely necessary for propagation, the larger the plant and the less disturbed the more luxuriant will probably be the flowering; plants should be weakened as little as possible by division. When it is really necessary to increase stock nothing is easier if care be taken. Some Orchids, as *Dendrobium moschatum*, *Paxtoni*, *Pierardii*, *nobile* &c., may be increased by cutting off an old pseudo bulb, after flowering and laying it upon damp moss, when fresh plants will quickly appear at the joints; these when matured, with good strong roots, may be separated and potted. Plants may be divided by cutting through the roots with a sharp knife, some being left attached to each piece.

Aerides, *Saccolabiums*, *Vandas*, &c., may be increased by cutting through the stem just below the first root. The roots of all Orchids should only be disturbed in the cold weather when the plants are at rest.

When Orchid flowers are fertilised they produce seed in astonishing abundance, each seed pod when ripe is filled with millions of minute grains, each grain being a perfect seed. It is however very difficult to raise Orchids from seed, although some wellknown nurserymen at home have even succeeded in producing hybrids. The usual mode is to spread the seed on a piece of cork covered with finely chopped moss and floated on the surface of water the whole protected by a large bell-glass. By this means seeds sometimes may be made to germinate, it is however very uncertain. I should think they might be raised in a closed bottle partly filled with damp moss, but I never tried the experiment.

Although of considerable value in the hot and cold weather a conservatory is by no means so useful during the rains except for *Cattleyas* and other Brazilian Orchids which do not require so much moisture. All East Indian Orchids are much better out in the open air protected by an airy shed from July to Septr., as the confined atmosphere of the conservatory tends to produce damp and rot, at least such is my experience and I immediately removed all my Dendrobes Aerides &c. &c., into the open air when they at once revived; they evidently required more vigorous stimulus than could be afforded in the close still atmosphere of the glass-house. With respect to exotic Orchids I cannot venture a decided opinion as my experience of them is at present limited, my great endeavour has been to carry them safely through the first season without risking them by forcing into vigorous growth lest moisture should be over supplied and the plants rot as some did upon which I tried the experiment. I believe that when they once survive the first season they become acclimatised and can be treated as Dendrobes &c. &c.

I have had one *Cattleya* for more than a year and after passing through the first season it has become strong and vigorous and promises flower this year; it is the same with most of the *Onciliums* and *Epidendrums* known in this country; they flourish with precisely the same treatment as our own Indian species.

Orchids marked thus (*) are in the collection of the Botanical Gardens, Calcutta.
(†) Are in my own collection.

Acanthoglossum.

No.	Name.	Country.	Colour of flower.	Remarks.
1	A. nervosum,	*Java.	..	

Acanthophippium.

Terrestrial. grow in pots with some light soil well drained.

*1	A. bicolor,			
2	„ Javanicum,	Java, ..	purple and yellow,	
3	,, striatum,	.. .. ..	white and purple,	
4	,, Sylhetense,	Sylhet, ..	cream colour,	

Aeranthus.

1	A. grandiflora,	Madagascar,		
2	,, sesquipedalis,	„		

Appendicula.

Lindley mentions	18 species of this	Orchid, all natives of Java.

Acineta.

This species produces flowers from the bottom of the roots, the stem shooting in a down-ward direction, hence the plant must be grown in a basket filled with moss and old bark and decayed leaves; requires plenty of water whilst growing.

No.	Name.	Country.	Colour of flower.	Remarks.
1	A. Barkerii, ..	Mexico, ...	yellow,	
2	„ Densa, ..	Costa Rica,	,,	Fragrant.
3	,, Humboldtii, ..	La Guayra,	chocolate and crimson,	

Aerides.

Plants which derive their nourishment almost entirely from the moisture contained in the atmosphere. They should be attached with copper wire to a mangoe stump, protecting the lower roots with moss, and during the growing season they will throw out long roots which will attach themselves to the supporting block. This beautiful species contains many fine varieties and requires a high degree of heat and moisture.

The foliage is dark green and should be frequently sponged to keep off dust, and this greatly improves the appearance of the whole plant. The flower makes its appearance on long drooping racemes.

No.	Names.	Country.	Colour of flower.	Remarks.
1	A. acuminatissimum,	Java.		
*†2	,, affine, ...	Sylhet, ..	Pink and purple.	
3	,, amplexicaule, ..	do.		
4	,, anceps, .. .	do.		
5	,, angustifolium, ..	do.		
6	,, appendiculatum, ..	Tavoy,		
7	,, arachnites, ..	Java,		
8	,, compressum, .	do.		
9	,, crispum, ...	E. I. Bombay	White tipped with pink	Also called A. Brookii
10	,, do. pallidum, ..	do. ..	do. but of a lighter shade.	
11	,, cylindricum, ..	Coimbatore,	White and red.	
12	,, emarginatum, ..	do.		
13	,, falcatum, ...	E. I. ..	White and crimson,	
†14	,, Fieldinghii, ..	Assam, ..	White and pink,	
15	,, flavidum, .. .	.. .. ..	Yellow and pink.	
16	,, hysterix, ...	do.		
17	,, larpentii,.. .			
18	,, maculosum, ..	Bombay, ..	Pink sp. with purple,	fragrant.
19	,, do. var. Schroderii,	do. ..	White & lilac sp. rose,	
20	,, minimum, ..	do.		
21	,, obtusum, ...	do.		
22	,, odontochilum, ..	Khassia Hills,		
*†23	,, odoratum,.. ..	India and China, ..	White stained with pink,	fragrant.
24	,, do. var. purpuratum	do. ..	White, darker.	
25	,, pallidum, ...	Philipine Isles, ..	White and rose,	
26	,, pusillum, ...	Java,		
27	,, refractum, ..	Khassia Hills,		
†28	,, roseum, ...	Darjeeling,	Rose sp. with purple.	
29	,, Schæderii,			
30	,, spurium, ...	Java,		
31	,, striatulum, ..	Khassia Hills,		
32	,, subulatum, ..	Java,		
33	,, tæniale, ...	Nepaul,		
34	,, teres, .. .	do.		
35	,, quinque vulnerum,	Manilla, ..	White and purple,	
36	,, testaceum, .	Ceylon, ..	White and Violet.	
*37	,, virens, .. .	Java, ..	White and purple.	
38	,, Wightianum, ..	Coimbatore,	Lilac, ...	
39	,, tessellatum, ..	E. I. ..	White light. green and purple,	fragrant.
40	,, suavissima, ..	Malacca, ..	White and lilac,	

Anœctochilus.

A beautiful, but diminutive species of Terrestrial Orchid, of a most delicate nature, and difficult to cultivate. It is valuable, not on account of its flowers, which are insignificant, but on account of the extreme beauty of its foliage. It should be planted in a small pot well drained and filled with a mixture of silver sand and chopped moss; the roots elevated slightly above the rim of the pot and the whole should be protected by a bell glass. When flowers appear they should be carefully cut off with a pair of scissors, that the full vigour of the plant may be thrown into the leaves.

No.	Name.	Country.	Colour of leaves.	Remarks.
1	A. argenteus, ..	. .. ..	Silver marks on bright green,	
2	„ brevelabris, ..	Assam, ..	Golden veins on deep purple,	
3	„ El. Dorado,			
4	„ flavescens, ..	Java,		
5	„ gracilis, ..	do.		
6	„ intermedius, ..	.. .. ..	Dark olive and gold-silky.	
7	„ lanceolatus, ..	Assam,		
8	„ Lobbü, ..		Very dark green and lighter marks,	
9	„ Lowü, ..	Borneo, ...	Dark green and crimson velvety,	
10	„ do. virescens,			
11	„ maculatus,			
12	„ pictus,			
13	„ pubescens, ..	Java,		
14	„ Roxburghü, ..	Nepaul and Sylhet,		
15	„ setaceus, ..	Ceylon and Java, .	Dark green golden network	
16	„ do. var cordatus			
17	„ do. „ intermedius,			
18	„ striatus, ..	.. .. ..	Narrow leaf, dark green and white stripe,	
19	„ Veitchii,			
20	„ xanthophyllus,	.. .. ..	Dark velvet broad orange and green stripe with a golden net-work,	

Angræcum.

This species are found in South Africa and Madagascar, they are very similar to Aerides and require similar treatment, they will also flourish in a basket filled with moss, and jammah. Care should be taken when watering that no moisture be allowed to remain upon the leaves lest they rot off and so greatly disfigure the plant.

No.	Name.	Country.	Colour of flower.	Remarks.
1	A. apiculatum, ..	Sierra Leone, ..	White and purple.	
2	,, arcuatum, .	Cape of G. Hope	White.	
3	,, Armeniacum,	do.	Apricot.	
4	,, bilobum, ..	Cape Coast, ..	White.	
5	,, caudatum, ..	Sierra Leone, ..	White and green.	
6	,, calceolus, ..	Mauritius and Bourbon.		
7	,, capense. ...	Cape of G. Hope.		
8	,, carpaphorum,	Mauritius.		
9	,, caulescens, ..	do.		
10	,, crassum, ..	do. and Madagas.		
11	,, cucullatum, ..	Mauritius.		
12	,, distichum, ..	do.		
13	,, eburneum, ..	Mauritius &c. ..	White.	
14	,, expansum, ..	do.		
15	,, filicornü. ..	Bourbon.		
16	,, filiforme, ..	Hispaniola.	Green & white frag.	
17	,, fragrans, ..	do.		
18	,, funale, ..	Jamaica, ..	.. .. .	The only species found in America.
19	,, gladü folium,	Mauritius, ..	White.	
20	,, Grantü, ..	C. Africa.		
21	,, implicatum, ..	Madagascar.		
22	,, inapterum, ..	Mauritius.		
23	,, monodon, ..	Africa, ...	Pink.	
24	,, multiflorum, ..	Bourbon. ..		
25	,, odoratissimum,	.. ..	White, fragrant.	
26	,, palmiforme. ..	,,		
27	,, pectinatum, ..	Mauritius.		
28	,, pellucidum, ..	Sierra Leone, ..	Snow white.	
29	,, pertusum, ..	do.	White.	
30	,, pescatorianum,	Bourbon, ..	do.	
+31	,, Richardianum.			
32	,, subulatum, ..	Sierra Leone.		
+33	,, superbum, ..	Madagascar.		
34	,, sesquipedalis,	Madagascar.		
35	,, triquetrum, ..	Mauritius.		
36	,, virens, ..	Bourbon, ..	White.	

Anguloa.

This being a Terrestrial Orchid requires growing in a pot filled with broken crocks, and a compost of partially decayed leaves, cocoanut fibre and heath soil. The flower stalk is thrown up from the base of the bulbs which are 3 inches high. Good drainage is very necessary and it is secured by half filling the pot with broken kunkah before putting in the soil. They are all natives of Columbia.

No.	Name.	Country.	Colour of flower.	Remarks.
*1	A. Clowesü,	Columbia,	Bright yellow and white.	
2	„ Ruckerü,	do.	Orange.	
3	„ superba,	Peru.		
4	„ uniflora,	do.	White, fragrant.	
5	„ do. var.	do.	White spotted with brown.	
6	.. ..	do.	Crimson.	

Ania.

No.	Name.	Country.	Colour of flower.	Remarks.
1	A. angustifolia	Tavoy.		
2	„ latifolia,	Sylhet,	Greenish brown.	

Arachnanthe.

In general appearance this plant bears a slight resemblance to *Renanthera coccinea*, having a straight upright stem with fine ever green leaves at regular intervals, the roots are similar to those of the Vandas, Aerides, &c. and project horizontally from the stem. This peculiarity necessitates that the plant should be attached to an upright mango post and the lower roots protected with moss.

No.	Name.	Country.	Colour of flower.	Remarks.
*†1	A. Moschifera,	Singapore,	Yellow and brown.	(Scorpion Orchid.)
		This is called	by Lindley, *Renanthera arachnites.*	

Ansellia.

An African Orchid of great beauty, it should be grown in a large pot filled with jammah, charcoal and moss, good drainage is essential, the flowers appear in a long raceme or panicle from the top of a long bulb.

No.	Name.	Country.	Colour of flower.	Remarks.
*1	A Africana, ..	Fernando Po,	Green, spotted with black, lip, yellow,	

Arundina.

A terrestrial Orchid, requiring light, free, rich soil, and good drainage.

No.	Name.	Country.	Colour of flower.	Remarks.
†*1	A bambusifolia,	Nepaul and Sylhet Assam,	Pink and purple.	
2	,, Chinensis, ..	Java and China,		
3	,, densa, ..	Singapore, ..	Lilac and pink, ..	Fragrant.
4	,, minor, ..	Ceylon.		
5	,, speciosa, ..	Java,		

Aporum.

Belonging to the same class as Dendrobiums. They possess erect or prostrate stems, succulent equitant leaves, and inconspicuous flowers, (Paxton.) They are scarcely worth cultivating except as botanical specimens.

No.	Name.	Country.	Colour of flower.	Remarks.
†*1	A. anceps, ..	Sunderbunds,		
*†2	,, cuspidatum, ..	Khassia Hills,		
3	,, incrassatum, ..	Java,		
4	,, indivisum, ..	,,		
5	,, leonis,			
6	,, lobatum, .	Java,		
7	,, micranthum,			
8	,, serra, ..	Penang & Singapore,		
9	,, sinnatum,			
10	,, subteres,			

Aspasia.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	A. epidendroides ..	Guatemala.		
2	„ lunata ..	Brazil ..	pale green	
3	„ variegata			

Aganisia.

Should be grown on a block & roots enveloped with moss.

No.	Name.	Country.	Colour of flower.	Remarks.
1	A. pulchella ..	Demerara,	pure white, lip slightly tinged with purple and yellow.	

Apaturia.

No.	Name.	Country.	Colour of flower.	Remarks.
1	A. Chinensis ..	China		
2	,, montana ..	Ceylon		
3	,, senilis ..	Sylhet		
4	,, Smithiana .	Oude		

Barkeria.

A very handsome American species having upright slender bulbs from the top of which the flower stalk projects; leaves drop off every year. Should be grown on a block of wood of a flat shape with but very little or no moss, and although plenty of light is a desideratum the rays of the sun should never be allowed to rest upon the plants, plenty of water should be given when it is in a growing state, but when at rest only twice a week. Temperature should be mild.

No.	Name.	Country.	Colour of flower.	Remarks.
1	B. elegans, ..			
2	„ Lindleyana, ...	Costa Rica,	purple and white,	
3	„ melanocaulon,	do.	lilac pink,	
†4	„ Skinneri, ..	Guatemala,	rose,	
†5	„ spectabilis, ..	do.	pink and crimson	

Bletia.

A terrestrial Orchid having round and flattish bulbs; should be grown in a pot having 2 inches of thorough drainage and then filled up with leaf mould, lumps of peat and charcoal mixed with chopped moss.

No.	Name.	Country.	Colour of flower.	Remarks.
1	B. acutipetala, ...	S. Carolina,		
	„ aphylla, ...	Carolina,		
2	„ campanulata,	Peru, ...	deep purple,	
3	„ catenulata, ...	do.	purple,	
	„ capitata, ...	West Indies,		
	„ coccinea, ...	Mexico,		
4	„ florida, ...	Trinidad, ...	pink,	
	„ Gebina, ...	Japan, ...	white and blush.	
5	„ Guiniensis,			
*†6	„ hyacinthia, ...	China, ...	deep purple,	
	„ latifolia, ...	Moluccas,		
	„ obcordata, ...	Sylhet,		
7	„ Parkinsonii, ...	Mexico, ...	rose colour,	
8	„ patula, ...	Jamaica, ...	deep purple,	
	„ punctata, ...	Mexico,		
9	„ Shepherdii, ...	Jamaica,	purple and yellow	
	„ speciosa, ...	Mexico,		
	„ tuberculosa, ...	Madagascar,		
10	„ verecunda ...	Jamaica, ...	purple,	
	„ villosa, ...	Mauritius,		

Bolbophyllum.

Small bulbs, which require but very little space to grow in. Should be bound with fine copper wire to small blocks of wood slightly covered with moss. Plenty of water when growing is essential.

No.	Name.	Country.	Colour of flower.	Remarks.
1	B. affine, ..	Nepaul,		
2	„ angustifolium,	Java,		
3	„ auricomum, ..	Tavoy,		
4	„ barbigerum, ..	Sierra Leone,	greenish brown,	**Remarkable for the constant motion of its flowers.**
5	„ bicolor, .	China,		
6	„ bracteolatum,	Demerara,	small and varied,	

Bolbophyllum. (*Continued.*)

No.	Name.	Country.	Colour of flowers.
7	B. cæspitosum,	Bourbon,	
8	„ calamaria,	Sierra Leone,	blood red,
9	„ capitatum,	Java,	
10	„ Careyanum,	Nepaul,	yellow mottled with red
11	„ caudatum,	Nepaul,	
12	„ cernuum,	Java,	
13	„ ciliatum,	”	
14	„ clavatum,	Mauritius,	
15	„ Commersonii,	Bourbon,	
16	„ cocoinum	Sierra Leone,	flesh colour,
17	„ croceum,	Java,	
18	„ cylindraceum,	East Indies,	
19	„ densum,	Mauritius,	
20	„ erectum,	Madagascar,	
*21	„ elegans,	Ceylon,	
22	„ flavescens,	Java,	
23	„ flexuosum,	Khassia Hills	
24	„ fuscescens,	Upper Assam	
25	„ galeatum,	Sierra Leone,	
26	„ gibbosum,	Java,	
27	„ gracile,	”	
*†28	„ gratum,	Nepaul,	
26	„ Henshallii,	Java,	deep yellow and purple
30	„ hirsutum,	”	
*†31	„ hirtum,	E. I.	purple and white,
32	„ inæquale,	Java,	
33	„ incurvum,	Mauritius,	
34	„ Jenkinsii,	Assam,	
35	„ laxiflorum,	Java,	
36	„ leopardinum,	E. I.	
37	„ Lobbii,	Java,	nankeen yellow,
38	„ macranthum,	Singapore,	pale lemon & chocolate
39	„ minutum,	Madagascar,	
40	„ mucronatum,	Java,	
41	„ mutabile,	”	
42	„ nutans,	Mauritius,	
43	„ obtusum,	Java,	
*44	„ odoratum,	”	
45	„ odoratissimum,	Nepaul,	
46	„ ovaliflora,	Java,	
47	„ parvulum,	”	
48	„ pendulum,	Mauritius,	
49	„ polyrhizum	E. Indies,	
50	„ pumilum,	Sierra Leone,	
51	„ pusillum,	Mauritius,	
52	„ pygmæum,	New Zealand,	
*53	„ radiatum,	Tavoy,	
54	„ recurvum,	Sierra Leone	
55	„ reptans,	Nepaul,	

Bolbophyllum (*Continued.*)

No.	Name.	Country.	Colour of flowers.	Remarks.
56	B. saltatorium, ..	Africa,	greenish brown,	
57	„ serpens, ..	Mauritius,		
58	„ sulcatum, ..	Java,		
59	„ tenellum, ..	„		
60	„ tenuifolium, ..	„		
61	„ tetragonum, ..	Sierra Leone		
62	„ tortuosum,	Java,		
63	„ umbellatum, ..	Nepaul,	yellow and crimson,	
64	„ variegatum, .	Bourbon,		
65	„ violaceum, ..	Java,		

Brassia.

A bulbous orchid. Should be grown in pots containing fibrous peat, and perfectly drained; they are evergreen, and require a good supply of water, when growing, and when at rest just enough to prevent them from shrivelling.

No.	Name.	Country.	Colour of flower.	Remarks.
1	B. brachiata, .. .	Guatemala,	greenish yellow,	
2	„ caudata, ...	West Indies,		
3	„ Keiliana, ...	.. ..	yellow,	
4	„ Lanceana, ...	Demerara, ..	yellow and brown,	
5	„ do. var: viridiflora,	do. ..	yellow and green, ...	fragrant.
6	„ Lawrenceana, ..	do. ..	do. and claret spots,	
7	„ maculata, major 6 ..	Jamaica, ...	do.	
8	„ verrucosa, ...	Mexico, ..	pale green and white,	
9	„ Wrayæ, ...	Guatemala,	do. and brown,	

Brassavola.

These may be grown either on blocks of wood in moss or in pots filled with stony soil, as kunkah, jammah and charcoal, they do not require much water; leaves ever-green.

No.	Name.	Country.	Colour of flower.	Remarks.
1	B. acaulis, .	C. America,	cream colour,	
2	„ appendiculata,	Mexico,		
3	„ Amazonica, ..	Peru,		
4	„ Augustata, ...	Demerara,		
5	„ cordata, .	Brazil,		
*†6	„ cucullata, ..	W. Indies,	white,	
7	„ Digbyana, ...	W. Indies, ..	white with purple streak	

Brassavola (*Concluded.*)

No.	Name.	Country.	Colour of flowers.	Remarks.
*†8	B. glauca, ..	Mexico, ..	white and pink, ..	fragrant.
9	„ grandifolium,			
10	„ Martiana, ..	Brazil, ..	white,	
11	„ nodosa, ..	Jamaica,		
12	„ Perrinii, ..			
	„ subulifolia,			
	„ tuberculata, ..	Brazil,		
	„ venosa, ..	Honduras, ..	white,	

Broughtonia.

Grow on a block of wood with moss.

No.	Name.	Country.	Colour of flower.	Remarks.
1	B. coccinea, ...	... ...	scarlet,	
2	„ Sangumea, ...	Jamaica, ...	crimson,	

Bifrenaria.

No.	Name.	Country.	Colour of flower.	Remarks.
1	B. atropurpurea,	Brazil.		
2	„ aurantiaca, ...	Demerara,		

Burlingtonia.

Should be grown in a basket filled with light porous stone, broken pots and moss. It is an ever-green.

No.	Name.	Country.	Colour of flower.	Remarks.
† 1	B. candida, ...	Demerara, ...	white,	
2	„ decora, ...	Brazil, ...	rose,	
3	„ fragrans, ...	„	yellow and white,	fragrant,
4	„ Granadensis,...			
5	„ maculata, ...	„	yellow and brown,	fragrant,
6	„ pubescens, ...	Pernambuco,	white,	
7	„ rigida, ...		purplish white,	frag. requires a wire trellis
† 8	„ venusta, ...	Brazil, ...	pure white with yellow in centre,	

Caladenia.

A Terrestrial Orchid requiring a rich, free soil, and perfect drainage must be abundantly watered in summer and placed in a sunny situation, when at rest should be kept quite dry.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	C. alata,	New Holland,		
2	„ alba,	„		
3	„ augustata,	Tasmânia,		
4	„ barbata,	„		
5	„ carnea,	New Holland,		
6	„ clavigera,	„	yellow and purple,	
7	„ congesta,	Tasmania,		
8	„ cœrulea,	New Holland,		
9	„ denticulata,	Swan River,	yellow and purple,	
10	„ dilatata,	Tasmania,	pale green and purple,	
11	„ discoidea,	Swan River,	yellowish green and purple,	
12	„ elongata,	„		
13	„ filamentosa,	Tasmania,	„ „	
14	„ pilifera,	Swan River,	deep purple,	
15	„ flava,	New Holland,	yellow	
16	„ gemmata,	Swan River,	purple,	
17	„ gracilis,	Tasmania,		
18	„ hirta,	Swan River,	whitish yellow and purple,	
19	„ ixioides,	„	yellow,	
20	„ latifolia,	Tasmania,	bright rose,	
21	„ longicauda,	W. Australia,	yellow and purple,	
22	„ marginata,	New Holland,	dingy purple,	
23	„ mollis,	Swan River,	pink,	
24	„ ochreata,	„		
25	„ pallida,	Tasmania,	colourless,	
26	„ Patersoni,	„	green yellow and purple	
27	„ reptans,	Swan River,	purple,	
28	„ sericla,	„	blue, or purple,	
29	„ testacea,	New Holland,	brown,	
30	„ unguiculata,	Swan River,	blue,	

Calanthe.

This is also a terrestrial Orchid, and should be grown in pots of large size, filled with loam, leaf mould and rotten dung which should never be allowed to become quite dry. Care should be taken to provide good drainage. This plant must be shaded from the direct sun, and on no account must water be permitted to lodge on the young foliage which is ever-green.

No.	Name.	Country.	Colour of flowers.	Remarks
1	C. abbreviata, ..	Java, ...	white,	
2	„ augustifolia, ..	„	white,	
3	„ bicolor, ..	Japan,		
*4	„ brevicornu, ..	Nepaul,		
†5	„ clavata, ..	Sylhet, ...	yellew,	
6	„ comosa,	Nelgherries,		
7	„ curculigoides,	Penang, ...	bright yellow,	
8	„ densiflora, .	Sylhet,		
9	„ dicolor, .	Java & Japan.	red and white,	
10	„ emarginata, .	Java, ...	viotet,	
11	„ flavicans, .	Mauritius, ...	white,	
12	„ furcata, .	Philippines,	do,	
13	„ gracilis, ..	Sylhet, ...	pale lilac,	
14	„ Griffithii, ..	Bhootan,		
15	„ Masuca, ..	Nepaul, ...	deep violet,	
16	„ ochracea, .	Japan, ...	yellowish brown,	
17	„ parviflora, .	Java,		
18	„ plantaginea,	Bhootan,		
19	„ puberula, .	Sylhet,		
20	„ pulchra,	Java, ...	arrange,	
21	„ purpurea, .	Ceylon, ...	purple,	
22	„ speciosa, ..	Java,		
23	„ striata, .	Japan, ...		
24	„ sylvatica, ..	C.&Mauritius	white,	
25	„ tricarinata, .	Nepaul,		
*26	„ veratrifolia,	Port Jackson	white,	
27	„ versicolor, .	E. I.	first blue changing gradually to brown.	
*28	„ vestita, .	Moulmein,..	Crimson centre, white.	
29	„ Dominiana-hy:			
30	„ Veetchii-hy :			

Camarotis.

Requires great care in cultivation, must be attached to a block protected with moss, requires plenty of heat and moisture and not much rest.

No.	Name.	Country.	Colour of flower.	Remarks:
*†1	C. purpurea,	Khassia,	rose.	
2	pallida,	do.		

Catasetum.

A very curious American species, in appearance not very unlike some of the Dendrobia of this country, having stout pseudo bulbs and requiring very similar treatment.

No.	Name.	Country.	Colour of flower.	Remarks.
1	C. abruptum, ...	Brazil,		
2	„ atratum, ...	„	brown purple,	
3	„ barbatum,			
4	„ callosum, .	La Guayra,	reddish brown,	
5	„ citrinum, ...	..	pale yellow,	
6	„ cristatum, ...	Brazil,		
7	„ cornutum, ...	Demerara, ...	green,	
8	„ deltoideum, ...	Guatemala,	greenish brown,	
9	„ fimbriatum, ...	.. ..	white and green,	
10	„ globiflorum, ...	Brazil, ...	purplish brown,	
11	„ Hookeri, ...	Brazil,		
12	„ integerrimum,	Guatemala.	green and purple,	
13	„ laminatum, ...	.. .	greenish brown,	
14	„ lanciferum, ...	Brazil ...	purple,	
15	„ Lansbergii, ...	Caracas, . .	green and purple,	
16	„ longifolium, ...	Guatemala,		
*17	„ luridum, ...	Brazil,		
18	„ maculatum, ...	New Grenada	green with purple spots,	
19	„ Naso, ...	...	greenish white,	
20	„ planiceps, ...	Spanish main	green and orange,	
21	„ purum, ...	Brazil,		
22	„ Russellianum,	Guatemala,	pale green and white,	
23	„ saccatum, ...	.. ..	orange,	
24	„ sanguineum,	C. America,	green brown and red,	
25	„ semiapertum,	Brazil,	green,	
26	„ serratum, ...	Panama, ...	pale green,	
*27	„ tridentatum,	Trinidad, ...	green,	
28	„ Trulla, ...	S. America,	deep green,	
29	„ veridiflavum,	C. America,	yellowish green,	
30	„ Wailesii, ...	Honduras,...	greenish yellow,	
31	„ Warczewiczii,	Panama, ...	pale green,	

Cattleya.

The most lovely and magnificent of all Orchids, with rich ever-green foliage and long delicate bulbs, from the bottom of which appear the flowers of extraordinary size. They are mostly grown in pots well elevated above the rim, soil light sandy rich leaf mould well mixed with Jammah, charcoal &c. &c. thoroughly drained; bulbs must be kept dry and the leaves frequently sponged, but never syringed, a humid atmosphere is necessary, as well as shade, and when at rest no water; a long rest is required; some Cattleyas grow well on a block of wood protected with moss.

Cattleyas are not thirsty plants and should be watered at the *roots only*, say twice a week even when in vigorous growth.

No.	Name.	Country.	Colour of flower.	Remarks.
*† 1	C. Aclandiæ, ..	Brazil, ..	chocolate and rose	grow on block.
† 2	„ amethystina,			
3	„ Arembergii,.	„	lilac,	
4	„ bicolor, ..	„	pale green and purple,	
5	„ bulbosa, ..	„	rose and crimson,	
6	„ candida, .	„	white and pink,	
*† 7	„ citrina, ..	Mexico,	bright yellow,	grow on block
*† 8	„ crispa, ..	Brazil,	white and crimson	
9	„ do. purpurea,	do.	do. and purple,	
	„ do. superba,	„	do. larger,	
10	„ Domingensis,	St. Domingo,		
11	„ Devoniensis,	hyb : Veitch,		
12	„ Dominiana alba			
13	„ elegans, ..	Brazil,	purple and brown	
14	„ elatior,			
*†15	„ Forbesii, .	„	greenish yellow,	
* 16	„ Grahami, ..	Mexico,		
17	„ granulosa,	Brazil, ..	olive colour,	lower temperature.
18	„ do. Leopoldina	Guatemala,	„	Ditto,
† 19	„ guttata, ..	Brazil,	yellow and crimson	
* 20	„ Harrisoniæ,	Brazil,	rose and yellow,	
21	„ do. alba, ..	do.	rose and white,	
22	„ do. var : ..	do.	lilac,	
23	„ hybrida picta,	hyb. ; Veitch		
† 24	„ intermedia violacea, ..	Brazil,	rose and purple,	
25	„ itrina, ..		pale yellow,	
† 26	„ labiata, ..	do.	rose and crimson,	
27	„ do, atropurpurea, ..	La Guayra,	bluish lilac,	
28	„ Lemoniana, ..	Brazil ..	pale pink,	
* 29	„ Leopoldina, ..	do.	yellow and crimson	
30	„ lobata, ..	do.	deep rose,	
† 31	„ Loddegesii ..	do.	rose and lilac,	
32	„ marginata, ..	do.	crimson and white	grow on block
33	„ maxima, ..	Columbia,	bright rose and crimson,	

Cattleya. (*Continued.*)

No.	Name.	Country.	Colour of flowers.	Remarks.
*†34	„ Mossiæ, .	La Guayra,	pink and purple,	
35	„ do, superba,	do,	do.	
36	„ Oxoniense, ...	hyb.; Veitch		
37	„ pallida, ..	Mexico, .	white and pink,	
38	„ Perrinii, ...	Brazil,		
39	„ pinelliana,			
40	„ pumila, ..	do.	rose and crimson,	
41	„ Pilcheri, ..	hyb.; Veitch		
42	„ quadricolor, ..	.. .	crimson and white,	
43	„ quincolor, ..	hyb.; Veitch	olive chocolate yellow.	
44	„ Reguellii,			
45	„ Russelliana,			
46	„ Schilleriana concolor :			
*†47	„ Skinnerii, ...	Guatemala,	purple,	requires greater heat.
48	„ speciosa,			
49	„ superba, ..	Demerara,	rose and crimson,	„ plenty of moss.
50	„ Trianædi, ..			
51	„ violacea, ...	Brazil, ...	violet and rose,	
52	„ Walkeriana, ...	„	rose,	
53	„ Warszewitzii,			

Cheirostylis.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	C. marmorata, ...	Borneo, .	white red & purple	
2	„ montana ...	Java,		
3	„ parvifolia, ...	Ceylon,		
4	„ pusilla, ...	Sylhet,		

Chysis.

A handsome American species best grown in baskets and moss.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	C. aurea, ..	Venezuela...	yellow and crimson	
2	„ bractescens, ..	Mexico, ..	white and yellow,	
3	„ lævis,			
4	„ Limminghii			

Cirrhopetalum.

Should be grown on blocks of wood, roots enveloped in moss.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	C. auratum, ..	Manilla, ...	yellow striped with crimson,	
2	„ Blumii ...	Java,		
3	„ candelabra, ..	Manilla, .	straw colr. and purple,	
4	„ chinense, ...	China, .	cream and crimson,	
5	„ cæspitosum, ..	Khassia Hills		
6	„ Cumingii, ...	Phillipines,	ruby red,	
7	„ fimbriatum, .	Bombay, ..	green,	
8	„ Lindleyanum,	Burmah,		
9	„ Macræi,	Ceylon, ..	deep yellow and purple	
10	„ Medusæ, .	Singapore, .	pink,	
11	„ nutans, ..	Manilla, .	yellow,	
12	„ thorarsii, ..	Java, Mauritius, &c...	yellow and red,	
13	„ vaginatum, ..	Singapore,		
14	„ Wallichii, ..	Nepaul,		

Cleisostoma.

No.	Name.	Country	Colour of flowers.	Remarks.
1	C. acaulis, ..	Ceylon,		
2	„ biclor, ..	Manilla, ..	pink and purple,	
3	„ callosa, ..	Java,		
4	„ crassifolium,..	Moulmein,	sea green,	
5	„ epicatum, ..	Borneo, ..	red and yellow,	
6	„ ionosmum, ..	Manilla, .	yellow and brown	
7	„ lanatum, ...	E. I, ..	yellow and purple	
8	„ maculosa, ...	Ceylon,		
9	„ rosea, ...	Manilla. ..	brown and yellow	
10	„ sagittata, ..	Java,		
11	„ spatulata, ..	„		
12	„ suaveolens, ..	„		
13	„ subulata, .	„		

Cœlogyne.

Cælogynes and Pleiones belong to the same family and are therefore classed together, some are evergreen, others deciduous, the flowers are generally the first, to appear sprouting from the young growth before leaves are formed.

They are best grown in pots or baskets filled with peat and rich leaf mould, well mixed with kunkah, jammah and charcoal or wood ashes, thorough drainage is essential and the whole covered with moss; plenty of water to be given when growing and a good season of rest allowed.

No.	Name.	Country.	Colour of flowers.	Remarks.
*1	C. barbata,	E. I.	pure White,	
*† 2	„ cristata,	Nepaul,	do. with yellow fringe.	
3	„ Cumminghü	Singapore,	white and yellow, fragrant.	
4	„ diphylla,	Khassia Hills,	white with voilet spots,	
5	„ elata,	do.	pale green,	
6	„ Falconeri,	Moulmein,		
7	„ fimbriata,	Nepaul,		
* 8	„ flaccida,	do.	white,	
9	„ flavida,	Sikkim,		
* 10	„ fuliginosa,	E. I.	light brown & purple	
11	„ fuscescens,	Nepaul,		
12	„ Gardneriana,	Khassia Hills,	white and yellow,	
13	„ glumacea	Sikkim,		
14	„ humilis,	Nepaul,	pale pink,	
15	„ Hookeriana,	Darjeeling,		
* 16	„ incrassata	Java,		
17	„ Lazenaria	Khassia Hills,	white,	
*†18	„ longifolia,	Java,		
19	„ longipes,			
*†20	„ Lowü	Borneo,	white and chocolate,	
21	„ maculata,	Khassia Hills,	white and crimson,	
*†22	„ miniata,	Java,		
* 23	„ media,			
*†24	„ nitida,	Nepaul,		
*†25	„ ocellata,	Sylhet,		
26	„ ochracea,	Darjeeling,	white and yellow,	
*†27	„ odoratissima,	Ceylon,		
28	„ ovalis,			
*†29	„ parviflora,			
30	„ præcox,	Nepaul	pale pink,	
31	„ prolifera,	„		
32	„ Parishü,	Moulmein,		
* 33	„ rigida,	Khassia Hills,		
*†34	„ Roohusgenü,	Java,		
* 35	„ speciosa,	Borneo,	brown and white	
* 36	„ trinervis,	Tavoy,		
37	„ trisaccata,	Khassia Hills,	white,	
38	„ undulata,		cream colour,	
39	„ uniflora,		rose and white,	
40	„ Walliohiana,	Khassia Hills,		

Coryanthes.

This species is remarkable for the large size of its flowers; its leaves are evergreen; should be grown in baskets with moss, and plenty of water must be supplied when growing.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Cor. Fieldingü,	.. ..	brownish yellow and crimson,	
2	„ macrantha, ..	Carracas, ..	Orange and purple,	
3	„ maculata, ..	Demerara, ..	yellow and crimson,	grow on block.
4	„ speciosa, ..	Brazil, ..	yellow, ..	fragrant,

Chrysoglossum.

A Terrestrial Orchid.

Chrys : villosum, Java.

Cycnoches.

The "*Swan*" Orchid; so called from the flower bearing a resemblance to a swan with a long neck; it is deciduous, and should be grown in a pot.

No.	Name.	Country.	Colour of flower.	Remarks.
1	Cy. aureum, ..	C. America, ..	pale yellow,	
2	„ barbatum, ..	Costa Rica, ...	flesh colr. and red,	
3	„ chlorochilum, ..	Maracaybo, .	greenish yellow,	
4	„ Egertonianum,	Guatemala and Mexico, ..	purple and green,	
5	„ do. var. viridi, ..	do.	green,	
6	„ Loddegesü ..	Surinam, ..	green purple and white,	
7	„ maculatum, ..	Mexico, ..	yellow and brown,	
8	„ musciferum,, ..	Columbia, ..	pale colr. sp. with brown,	
9	„ pentadactylon, ..	Brazil, ..	yellowish green,	
10	„ Pescatorei, ..	New Grenada,	yellow and brown,	
11	„ ventricosum, ..	Guatemala, ..	green and white,	

Cymbidium.

Grow in pots or baskets, filled with rough peat-bark-charcoal, Jammah and moss well drained, require a hot and humid atmosphere when making growth, and as the roots are delicate they should not be disturbed more than absolutely necessary.

No.	Name.	Cuntry.	Colour of flowers.	Remarks.
1	Cym. aculeatum,	Cape of Good Hope,		
*†2	„ aloifolium,			
3	„ bicolor,	Ceylon,		
4	„ candidum,	Popaya,		
5	„ canaliculatum,	New Holland,		
6	„ cordigerum,	Venezuela,		
7	„ cuspidatum,	Java,		
8	„ cyperifolium,	Sylhet,		
9	„ Devonianum,	Khassia Hills,	cream & purple	
10	„ diurnum,	Bahamas,		
*†11	„ eburneum,	E. I.	white and yellow,	
12	„ elegans,	Nepaul,	green and yellow,	leaves denticulated,
*13	„ ensifolium.	China,		
14	„ Finlaysonianum,	Cochin China		
15	„ flabellatum,	Madagascar,		
16	„ flabelliforme,	Jamaica,		
17	„ Gibsoni	Khassia Hills,	green and brown,	
*†18	„ giganteum,	Nepaul.	brown and purple,	
19	„ glandulosum,	Caraccas,		
20	„ hæmatodes,	Ceylon,		
†21	„ inconspicuum	Assam,	yellowish brown,	leaves terete
22	„ iridifolium,	Nepaul,	dark brown,	
*23	„ Javanicum,	Java,		
24	„ lancifolium,	Nepaul,		
25	„ limbatum,	Trinidad,		
26	„ longipetalum,	Sylhet,		
27	„ longifolium,	Nepaul,		
28	„ marcrorhizon,	Cashmere,		
29	„ marginatum,	Brazil,		
*†30	„ Mastersii	E. I.	snow white & fragt.	
31	„ ochroleuchum,	Demerara,	cream and yellow,	
*32	„ pendulum,	Sylhet,	brown red and white	
33	„ do. var. brevilab	Singapore,		
34	„ pubescens,	„	purplish brown and yellow,	
35	„ sinensis,	China,		
36	„ striatum,	Sylhet.		
37	„ suave,	Port Jackson,		
38	„ subulatum,	Jamaica,		
39	„ tabulare,	C. of G. H.		
40	„ tenuifolium,	Ceylon,		
41	„ trinerve,	Essequibo,		
42	„ triste,	Japan & Ceylon,	purple yellow,	
43	„ utriculatum,	Jamaica,		
44	„ vestitum,	„		
45	“ violaceum,	Orinoco,		
46	„ Wallichii	Penang,		
47	„ xiphiifolium,	China,		

Cypripedium.

Cypripedium (Lady's slipper Orchids) are generally dwarf, compact and evergreen, should be grown in pots, with peat soil, well drained and copiously watered, the roots should never be allowed to become quite dry.

No.	Name.	Country.	Colour of flower.	Remarks.
1	Cyp. arietinum, ..	Canada, ..	greenish brown,	
*2	,, barbatum, ...	Malacca, ..	purple and white,	
3	,, calceolus, ..	England, .	purple and yellow,	
4	,, candidum, ..	U. S. America,	white,	
5	,, caricinum, ..	Bolivia,		
6	,, calycinum,			
7	,, caudatum, ..	Peru, ..	yellow and green,	
*†8	,, concolor, .	Moulmein, ..	pale yellow spotted with purple,	
9	,, cordigerum, ..	W. Indies, ...	white,	
10	,, Fairreanum,			
11	,, glanduliflorum	New Guinea, ..	pale pink,	
12	,, guttatum, .	Siberia, ...	white and purple,	
13	,, hirsutissimum, .	.. ...	purple and green,	
14	,, Hookeriœ,			
15	,, humile, ..	Canada, ..	purple and brown,	
†16	,, insigne, ..	Sylhet, ..	yellow green brown white and orange,	
17	,, irapeanum, ..	Mexico, ..	pale yellow,	
18	,, Japonicum, ..	Japan,		
19	,, Javanicum, ..	Java, ..	green and pink,	
20	,, Lindleyanum, ..	Guayana, ..	brown and green,	
21	,, lœvigatum, ...	Manilla, ...	purple and white,	
22	,, Lowii ..	Java & Borneo,	purple,	
23	,, macranthon, :	Siberia, ..	,,	
24	,, molle, ..	Mexico,		
25	,, montanum, ..	U. S. A- ...	white,	
26	,, nigrum,			
27	,, palmifolium, .	Br : Guayana,	yellow and purple,	
28	,, parviflorum, ...	Canada, ...	brown and yellow,	fragrant.
29	,, passerinum ...	U. S. A.		
30	,, Pearcii, ..			
31	,, pubescens, ..	,,	yellow,	
32	,, purpuratum, ...	Ind : Isles, ...	purple and white,	
33	,, spectabile,	U. S. A.		
34	,, Stockeii, ...			
35	,, Stonei, ..			
36	,, superbum, ..			
37	,, ventricosum, ..	Siberia, ..	purple and yellow,	
*†38	,, venustum, ...	Sylhet	green and purple,	
39	,, villosum,			

Cyrtochilum.

Require either pot, or log culture, or better still a basket filled with turfy peat and moss.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Cyr. Bigtonense, ..		lilac and brown	gigantic,
2	,, citrinum, ..	C. America, ..	lemon colour,	
3	,, filipes, ..	Guatemala, ..	yellow and brown	
4	,, flavescens, ..			
5	,, flexuosum, ..	New Grenada.		
6	,, hastatum, ..			
7	,, ixioides, ..	New Grenada,		
8	,, maculatum, ..	Vera Cruz, ..	green and brown,	
9	,, mystacinum, ..	Peru, ..	yellow,	
10	,, pardinum, ..	,,		
11	,, stellatum, ..		cream and pink,	
12	,, undulatum, ..	New Grenada,		

Cyrtopodium.

This Orchid should be grown in a soil of rich leaf mould mixed with moss, no rest should be allowed in winter, should be placed on the hottest and moistest part of the house: leaves are palm like.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Cyr. Andersonii, ...	West Indies,	yellow,	
2	,, cardiochilum, ...		yellow and crimson,	
3	,, glutiniferum, ..	Brazil,		
4	,, punchtatum, ..	,,	greenish speckled with crimson,	

Calypso.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Calypso borealis, ...	Asia ..		

Chelonanthera.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Chel. gibbosa, ..	Java,		
2	,, sulphurea, ..	,,		
3	,, ventricosa, ..	,,		

Comparettia.

Should be grown on a block of wood, care being taken not to water too freely.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	C. coccinea, ..	Xalapa & Brazil,	scarlet,	
2	„ falcata, .	Rio Potachic, ..	rosy purple,	
3	„ rosea, ..	Spanish Main, ..	rose crimson,	

Ceratochilus.

Three species mentioned by Lindley, all natives of Java.

Ceratostylis.

Six species mentioned by Lindley, all natives of Java.

Cirrhæa.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Cirr. fuscolutea,..	Brazil,		
2	„ Loddegesii, ..	„		
3	„ viridipurpurea,	„		

Cryptochilus.

No.	Name.	Country.	Colour of flowers,	Remarks.
1	Cryp. sanguinea,	Nepaul,	scarlet,	

Cryptopus.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Cr. elatus, ...	Madagascar & Mauritius,		

Cyrtopera.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Cyr. bicarinata, ..	E. I.		
2	„ flava, ..	Himmalayas,		
3	„ gigantea, ..	Cape of G. H.		
4	„ obtusa, ..	E. I.		
5	„ pedicellata, ..	Cape of G. H.		
6	„ plantaginea, .	Madagascar,		
7	„ plicata, ..	E. I.		
8	„ scabrilinguis,	Peru,		
9	„ Woodfordii, ..	Trinidad,		

Cyrtosia.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Cyr. altissima, ...	Java,		
2	„ Javanica, ..	„		

Cytheris.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Cy. cordifolia, ...	Sylhet,		

Dendrochilum.

No.	Name.	Country.	Colour of flower.	Remarks.
1	Dend. aurantiacum	Java,		
2	„ abbreviatum, .	„		
3	„ cornutum, .	„		
4	„ edentulum, ..	„		
5	„ occultum, .	Mauritius,		
6	„ pallidiflavens,	Java,		
7	„ simile, ..	„		

Dienia.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	D. calycina, ..	Mexico,		
2	„ congesta, ..	Nepaul and China,		
3	„ cylindrostachya	Nepaul,		
4	„ fusca, ..	Ceylon,		
5	„ Gmelini, ..	Siberia,		
6	„ Myurus, .	Mexico,		
7	„ muscifera, ..	Nepaul,		

Doritis.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Dor. pulcherrima,	Cochin China,		

Dichæa.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Dich. echinocarpa,	Guyana,		
2	„ glauca, ..	Jamaica,		
3	„ graminioides,	„		
4	„ latifolia, ..	St. Vincent,		
5	„ muricata, ...	Brazil,		
6	„ Panamensis, ..	Panama,		
7	„ trichocarpa, ...	Jamaica,		

Dendrobiums.

This is one of the largest as well as the most varied of the Orchid tribe, not only in size and colour but also in growth. Some are dwarf and seem to consist of nothing more than a creeping rhizome bearing solitary coriaceous leaves; others of pseudo bulbs, with single or double leaves; whilst others, again, grow in long thick flower stems with large fleshy leaves of a brilliant dark green, forming magnificent plants; the flowers appear sometimes singly along the pseudo bulb at the joints, and at other times in splendid clusters. The colour varies from the purest white to the darkest purple, the delicate pinks, yellows, and lilacs predominating. The mode of cultivation is also varied according to the habit of the plant, most will grow luxuriantly in a basket lined with moss, and filled with kunkah, charcoal and bark. The pendant kinds require fastening on to a block of wood covered with moss, whilst some are best in a pot well drained and full of the same compost as for baskets. Many Dendrobes are deliciously fragrant and all require a good season of rest, and, when growing, plenty of heat and moisture; frequent syringing is very beneficial. Refrain from watering for one month or six weeks, say December and half January.

No.	Name.	Country.	Colour of flower.	Remarks.	Class.
1	D. acerosum,	...	..	..	B
2	,, aciculare,	..	..	..	B
3	,, acuminatissimum,	Java,	..	..	Db
† 4	,, aduncum,	Manilla,	white and pink,	..	Fa
* 5	,, æmulum,	Australia,	yellowish white,	..	Ha
6	,, affine,	..	..	..	G
*† 7	,, aggregatum,	India, Arracan,	pale yellow,	..	Hb
8	,, albosanguineum,	Moulmein	white & sanguine,		
9	,, album,	India,	white,	fragrant,	
10	,, alpestre,	..	white and purple,	..	Fb
* 11	,, amænum,	Nepaul,	do.	..	Da
12	,, amplum,	Khassia Hills,	yellow and brown		
*† 13	,, angulatum,	India, Java,	white and yellow,	..	C
14	,, do. wallich,	do.	..	..	Db
* 15	,, anosmum,	Manilla,	lilac rose & white,	muskyscent	Da
16	,, antennatum,	...	...	..	G
17	,, appendiculatum,	Java,	...	..	Ia
18	,, aqueum,	India,	pale green,	..	Db
19	,, angustifolium,	Java,		..	Ib
† 20	,, aureum, *See heterocarpum,*	India,	pale yellow,	fragrant,	Da
21	,, auriferum,	China,	yellow,	..	Fa
* 22	,, barbatum,	Bombay,	white,		Fb
23	,, bicameratum,	Khassias,	..	..	Fb
24	,, bicolor,	Ceylon,	white,	..	Fb
25	,, bifarium,	Penang,			
26	,, biflorum,	Society Isles,	..	..	Db

Dendrobiums,—(Continued.)

No.	Name.	Country.	Colour of flower.	Remarks.	Class.
27	D. Biggibum, ..	Australia, ..	purple,		
28	,, bilobum, ..	..	..	..	Db
29	,, Blandyanum,				
30	,, Blumei ..	Java,	..	..	C
31	,, braccatum, ..	Ceylon,	..	..	Ia
32	,, breviflorum, ..	Singapore,	...	.	
33	,, calamiforme, ..	Australia, ...	white and purple,	...	B
34	,, calcaratum, ..	Vanikosa,	..	..	Db
*† 35	,, calceolare, ..	India, ..	Orange,		
*† 36	,, Cambridgeanum, ..	do. ..	orange & crimson		
37	,, canaliculatum.	New Holland,	...	..	Ha
38	,, candidum, ..	Khassia Hills,	white,		
39	,, carinatum, .	Luzon Isles,			
40	,, cassythoides,	..	..	:	Fa
41	,, catenatum, ..	Japan, ...	white and green,	..	Fb
42	,, Ceraia, .	Cochin China,			
43	,, chlorops, ..		white & primrose,		
*† 44	,, chrysanthum,	India, ..	yellow and red,	..	Da
*† 45	,, chrysotoxum,	do.	pale yellow	fragrant,	Hb
46	,, clavatum, ..	Assam,	bright yellow.		
*† 47	,, cærulescens, ..	India, ..	bluish purple and rose,	..	Da
48	,, comatum, .	Java,			
49	,, compressum, ..	Ceylon, ..	yellow,	..	b
50	,, connatum, ..	Java, ..	greenish white,	..	C
51	,, convexum, ..	do.		..	Ib
52	,, crepidatum, ..	Indian Archipelago, ..	white pink and yellow,		
*† 53	,, cretaceum, ..	Moulmein, ..	white.	..	Da
54	,, crispatum, ..	Society Isles,	..	..	B
55	,, criniferum, ..	..	..	..	C
* 56	,, crumenatum,	Indian Archipelago, ..	white and pink.	fragrant,	Db
57	,, cucullatum, ..	India, ..	pinkish white,	pendent,	
58	,, Cunninghamii	..	..	..	Db
59	,, cucumerinum,	Australia, ..	white and pink,	..	K
60	,, cupreum, .	India, ..	red and buff,	..	Fa
61	,, cuspidatum, .	Tavoy, ...	white,	..	Fb
62	,, cymbidiodes, ..	Java,	..	..	Ib
*† 63	,, Dalhouseanum	Burmah, .	lemon and pink with crimson spot,	..	Fa
*† 64	,, Dayanum, ..				
† 65	,, densiflorum,	India, ..	yellow,	..	Hb
66	,, do, album, ...	do. ..	white,	..	Hb
67	,, denudans, ..	Nepaul, ..	greenish white and lilac,	..	Fb
*† 68	,, Devonianum,	Khassia Hills,	white and pink,	pendent,	
69	,, discolor, ..	Java, ..	yellow and brown,		
70	,, Egertoniæ, ..	India, ..	pale pink,		
71	,, elongatum, ..	Australia, .	yellow and purple	.	Fb
72	,, erosum. ..	..	..	..	E

Dendrobiums,—(Continued.)

No.	Name.	Country.	Colour of flower.	Remarks.	Class.
73	D. excisum,	.	..	..	Db
74	,, extinctorum,	..	...	..	Ib
75	,, eburneum,				
† 76	,, Falconeri,	India,	white tipped with pink stems strongly knotted,		
*† 77	,, Farmeri,	do.	pink and yellow,		
*† 78	,, fimbriatum,	do.	yellow,		
*† 79	,, do. occulatum	do.	do. with brown spot,		
80	,, flavescens,	Java,	yellow.		
81	,, foliosum,	do.			
*† 82	,, formosum,	India.	snow white,	...	Fa
*† 83	,, fuscatum,	Sikkim,			
84	,, gemellum,	Indian Archipelago,	yellowish green,		
85	,, geminatum,	Java,	..	..	Ib
*† 86	,, Gibsoni,	India,	apricot yellow,		
87	,, gracile,	Java,	..	..	B
88	,, grandiflorum,	do.	purple,	..	Ib
89	,, Griffitheanum,	Khassia Hill,	..	..	Hb
90	,, Grotü.	Moulmein,	purple,		
91	,, Hasseltü,	Java,	..	...	E
92	,, herbaceum,	India,	green,	..	Fa
93	,, heterocarpum,	India,	buff and orange,	fragrant,	Da
94	,, Heymanum,	Bombay,	white and pink,	..	Fb
95	,, hymenophyllum	Java,	greenish,	...	E
96	,, Hedyosmum,	Moulmein,	white and orange,	fragrant,	
97	,, Hillü,	Australia,	..		
98	,, infundibulum,	..	..		
99	,, Japonicum,	Japan,	lilac,	..	Fa
†100	,, Jenkinsü,	Assam,	buff,	..	Ia
101	,, junceum,	.	..	..	B
*†102	,, Jenningsü,	Assam,	peach colour,		
103	,, Jerdonianum,	Neilgherries,	yellow.		
104	,, Kingianum,	Australia,	pink,	..	Ha
105	,, Kuhlü,	Java.	bright rose,	...	E
106	,, lamellatum,	..	..	..	Ia
107	,, lancefolium,	..	..	..	Fb
108	,, linguæforme,	Pacific Isles,	white,	..	K
109	,, longicolle,	..	..	..	Ha
*†110	,, longicornu,	India,	yellow and orange red,	..	Db
111	,, Luzonense,	..	..		
* 112	,, luteolum,	Moulmein,	pale yellow,	..	Db
113	,, Macræa,	Ceylon,	..	..	Ha
114	,, macranthum,	..	..	..	E
* 115	,, macrostachyum,	Ceylon,	green.	..	Da
116	,, macrophyllum,	Philippines,	pinkish lilac	..	Da
117	,, mesochlorum,	India,	white and pink.	..	Da
118	,, microbolbon,	..	..	..	Ib

Dendrobiums,—(Continued.)

No.	Name.	Country.	Colour of flower.	Remarks.	Class.
119	D. mirbellianum,	..	..	...	E
120	„ moniliforme, ..	Japan, ..	rose,	..	Da
†121	„ moschatum, ..	Burmah, ..	nankeen & purple,	musky scent,	Fa
†122	„ multicaule, ...	Andamas, ..			
123	„ muscicola, ..	Nepaul, ..	..	..	Ia
124	„ McCarthiæ, ..	Ceylon, ..	rose,		
125	„ mutabile, ..	Java, ..	rose,	..	Fa
†126	„ nobile, ..	India, ..	pink and white.	..	Da
†127	„ nodosum, ..	Moulmein, .	white and yellow,		
128	„ nudum, ..	Java, ..	pale purple,	..	Fa
129	„ nutans, ..	Ceylon, ..	white and yellow,	..	Da
130	„ ochreatum, ..	Khassia Hills,	rich yellow,	..	Da
131	„ palpebræ, ..	India, ..	white and yellow,	..	H
132	„ paniculatum,	Sierra Leone,			
†133	„ Paxtoni, ..	Khassia Hills,	orange,	..	Da
†134	„ Pierardii, ..	do.	white and pink,	..	Da
†135	„ planibulbe, ..	..	.	.	C
136	„ plicatile, ..	..	..	..	Ia
137	„ polyanthum. ..	Moulmein, ..	yellow,	..	Fa
†138	„ polyarthrum, ..	Assam, ..	white and pink,		
139	„ primulinum, .	Darjeeling, and Assam, ..	stem spotted with white,		
†140	„ pseudaclinia, ..	Bhootan, ..	apricot colour,	...	K
141	„ pugioniforme,	..	..	..	K
142	„ pulchellum purpureum, ..	Sylhet, ..	white,	..	Da
143	„ pusillum, ..	Java, ..	..	..	Ia
144	„ Pygmæum, ..	Burmah, ..	..		Ia
145	„ ramosum, ..	India, Parisnath, ..	..	..	Fa
146	„ Reinwardii ..	..	..		E
147	„ revolutum, ...	Manilla, ..	white with orange bars,	..	Db
148	„ rhombeum, ..	do. ..	yellow,	..	Fa
149	„ rigidum, ..	New Holland,	..	..	K
150	„ Ruckeri, ...	Philippines, ..	Nankeen colour,	..	Db
151	„ rugosum, ..	Java, ..	pale yellow,	..	Da
152	„ roseum, ..	Sierra Leone			
153	„ salaccense, ..	Java, ..	deep yellow,	..	Da
154	„ sanguinolentum	Ceylon, ..	violet,	..	Db
155	„ schæminum, ..	..	..	..	B
156	„ sclerophyllum,	Java, .	white,	..	Fa
157	„ scopa, ..	..	..	..	C
†158	„ secundum, ..	China, Burma,	rosy purple,	..	E
159	„ speciosum, ..	Australia, ..	yellow,	fragrant,	Ha
160	„ stuposum, ..	India, ...	white and orange,	..	Da
161	„ subacaule, ..	..	..	...	Ia
162	„ subulatum, ..	Java, ..	..	..	Ia
163	„ sulcatum, ...	India, .	orange,	..	Fa

Dendrobiums,—(Continued.)

No.	Name.	Country.	Colour of flower.	Remarks.	Class.
164	D. sarcostoma, ..	Java,			
* 165	„ senile, ..		golden,		
166	„ taurinum, ...	Manilla, ..	yellow and purple,	..	G
167	„ tenellum, ..	Java, ...	..	..	B
168	„ teres, ..		..	..	B
179	„ teritifolium, ..	Australia, ..	greenish yellow striped purple & white,	..	B
170	„ tetrædre, ..	Java, ..	..	..	Db
171	„ tertagonium, ..	Australia, ..	..	..	Ha
172	„ tortile, .	Java, ..	primrose & violet,	..	Da
†173	„ transparens, .	Nepaul, ..	pinkish lilac,	..	Da
174	„ triadentiferum,		..	..	Db
175	„ triadenum, ..	Java, ...	white and violet,	..	Fa
176	„ tricuspi, ...	do.	..	:	Ia
177	„ triflorum, .	do.	..	..	Ia
*†178	„ Tattonense, ..	Australia, ..	white yellow and purple,		
179	„ Thompsonianum, ..	Bootan, ..	like "nobile" but *bulbs flat.*		
†180	„ undulatum, ..	Java, ..	yellowish brown & lilac,	..	G
181	„ Veitchianum,	„	white and crimson,	...	Ha
†182	„ velocidum,				
183	„ veratrifolium,	..	..	...	G
* 184	„ villosulum, ..	Tellicherry, ...	orange pendent,		
185	„ vestitum, ..	Singapore,			
†186	„ Wallichianum,	Nepaul,			
187	„ Wardianum,				
* 188	„ xanthophlebium,				

The following is Sir Joseph Paxton's classification of Dendrobiums.

A. Aporum, erect or prostrate stems, succulent equitant leaves, and inconspicuous flowers. (see *Aporum*).

B. Strongyle. all Dends. with tapering or awl shaped leaves.

C. Desmotrichum with flat leaves, and more conspicuous flowers, erect stems often more or less distended into pseudo-bulbs, end of lip broken up into long tufted fringes or marginal threads.

Dendrobium,—(continued.)

D. Eu dendrobium, with long lofty stems erect or pendulous, flowers in lateral pairs, no feathery lip.

(a) Lip, undivided	(b). Lip. three lobed
Type. *D, nobile,*	Type. *D, longicornu*

E. Pendilonum, like the above with flowers in racemes, diminutive petals and a long narrow naked lip, Type. *D. secundum.*

F. Stachyobium, like the above only with large full grown petals and broad dilated lip.

(a) lip undivided	(b) Lip, three lobed
Type *D. Dalhousianum,*	Type. *D. denudans.*

G. Ceratobium, tall erect stems, flat leaves, long racemes of flowers, conspicuous for their long antennœ like petals.

Type *D. taurinum.*

H. Dendrocoryne, stem contracted at base and clubshaped, leaves only at extreme end

(a) inflorescence terminal	(b). do, lateral.
Type *D. Kingianum.*	Type *D. densiflorum.*

I. Bolbodium, in lieu of stems, these are furnished with pseudobulbs, sitting on a prostrate rhizome

(a) lip undivided,	(b) lip three lobed.
Type. *D. subacaule.*	Type *D. microbolbon.*

K. Rhizobium, a creeping rhizome bearing solitary coreaceous leaves.

Type *D. rigidum.*

Diuris.

Terrestrial Orchids.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Diu. Diuris alba,...	Australia, ...	white,	
2	„ aurea, ...	„	yellow,	

Diuris,—(Continued.)

No.	Name.	Country.	Colour of flowers.	Remarks.
3	„ carinata, ...	Swan River,	yellow and purple,	
4	„ corymbosa, ...	Tasmania, ...	purple,	
5	„ curvifolia, ...	„	„	
6	„ Drummondii,	Swan River	„	
7	„ elongata, ...	Port Jackson	white,	
8	„ emarginata, ...	Australia,		
9	„ filifolia, ...	do.	yellow,	
10	„ lanceolata, ...	Tasmania,		
11	„ laxiflora, ...	Swan River,	dark yellow,	
12	„ longifolia, ...	Australia ...	large purple,	
13	„ maculata, ...	Port Jackson,	purple,	
14	„ pardina, ...	Australia, ...	„	
15	„ pauciflora, ...	do.		
16	„ pedunculata,	do.	purple,	
17	„ palustris, ...	Tasmania,		
18	„ porrifolia, ...	Swan River,	purple and yellow	
19	„ setacea, ...	Australia,		
20	„ sulphurea, ...	do.	purple,	

Epidendrum.

Evergreen and compact Orchids having tall slender bulbs. Some are best grown on blocks of wood covered with moss, whilst others require a soil of heath and broken jammah. All of them must enjoy a humid atmosphere.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Epid: aciculare, ..	Mexico, ...	purple,	
2	„ acuminatum, ..	Peru.		
3	„ adenocarpum, ..	Mexico,		
4	„ adenocaulon, ..	„		
5	„ alatum, ..	„	yellow and purple,	
6	„ aloifolium, ..	Guatemala,	yellow and white,	
7	„ altissimum, ..	Bahamas,		
8	„ altripterum, ..	Mexico, ..	dull purple	
9	„ anisatum, ..	„		
10	„ antenniferum, ..	Xalapa,		
11	„ armeniacum,	..	apricot,	
12	„ aromaticum, .	Guatemala,	dull yellow,	

Epidendrum,—(Continued.)

No.	Name.	Country.	Colour of flower.	Remarks.
13	Epid : aurantiacum,	Guatemala,	orange,	
†14	„ auropurpureum,	Hispagnola,		
15	„ bicornutum, ..	Guayana, ...	pure white fragrant,	
16	„ bidentatum,	Mexico,		
17	„ bifarium, ..	Jamaica,		
18	„ bifidum, ..	St. Chrystopher, ..		
19	„ Boothianum, ..	..	yellow and red,	
20	„ brachiatum, ..	Mexico,		
21	„ bractescens, ..	„	purple and white,	
22	„ calocheilum, ..	Guatemala,	yellowish green and purple,	
23	„ cepiforme, ..	Mexico, ...	orange, and red,	
24	„ cernuum, .	Andes,		
25	„ chloroleucum, ..	Demerara, ...	pale green and white,	
*†26	„ ciliare, ..	Martinique,		
27	„ cinnabarinum, ..	Pernambuco,	scarlet,	
*†28	„ cochleatum, ..	West Indies,		
29	„ colorans, ..	Guatemala,	pink,	
30	„ concolor, ..	Mexico, ...	pale yellow,	
31	„ conopseum, ..	Carolina,		
32	„ cordatum, ..	Peru,		
33	„ coriïfolium, ..	Central America, ...	green,	
34	„ coronatum, .	Peru,		
†*35	„ crassifolium ..	St. Vincent,	rose colour,	
36	„ cristatum, .	Peru,		
37	„ cuspidatum, ..	Mexico,		
38	„ cnemidophorum,	Guatemala,	orange,	
39	„ diceratum, ...	Guayana, ...	purple,	
40	„ dichotomum, ...	Peru,		
41	„ diffusum,			
42	„ dipus, ..	Brazil, ...	green brown and white,	fragrant,
43	„ dichomum, amabile, ...	South America, ...	rose,	
44	„ ellipticum			
45	„ elongatum,			
46	„ erubescens,			
47	„ falcatum, ...	Mexico,		
48	„ ferrugineum, ...	Peru,		
49	„ filicaule, ...	Brazil,		
50	„ fimbriatum, ...	Andes,		
51	„ flavum, ...	Brazil, ...	pale yellow,	
52	„ floribundum, ...	Mexico, ..	greenish brown and purple,	
53	„ fragrans, ...	Jamaica,	green,	

Epidendrum,—(Continued.)

No.	Name.	Country,	Colour of flower.	Remarks.
54	Epid : flexuosum,.	Essequibo,		
55	„ fruticosum, ..	Mexico,		
56	„ fucatum, ..	Cuba, ...	yellow and pink,	
57	„ fuscatum, .	Jamaica,		
58	„ geminiflorum, ..	Popaya,		
59	„ gladiatum, ..	Peru,		
60	„ glumenaceum, ..	Brazil, ...	purple and white,	
61	„ glutinosum, ..	Rio Janerio,	green and purple,	
62	„ Grahamii, ..	Mexico, ...	yellowish green brown and red,	
63	„ gramineum, ..	Peru,		
64	„ gracile, ..	Bahamas, ...	green and purple,	
65	„ grandiflorum, ..			
66	„ graniticum, .	Guayana, ...	green purple and white,	
67	„ Guatemalense, ..	Guatemala,	yellow and purple,	
68	„ Hanburyanum, .	Mexico, ...	purple,	
69	„ Hankeyanum, ..	Peru,		
70	„ Humboldtii, ..	PuertoCaballo		
71	„ ibaguense, ..	New Grenada		
72	„ imatophyllum, ..	Guayana,		
73	„ imbricatum, ..	Brazil,		
74	„ ionosma, .		dark brown,	fragrant,
75	„ labiatum, ..	Hispagnola,		
76	„ lancifolium, ..	Mexico, ...	pale yellow,	
77	„ latifolium, ..	Tropical America,		
78	„ lentiginosum, ..	Demerara, ...	yellowish green,	
79	„ leucochilum, ..	New Grenada	yellow and white,	
80	„ lignosum, ..	Mexico,		
81	„ lingulatum, ..	„		
82	„ Linkianum, ..	„	yellow and purple,	
83	„ lineare, ..	Peru,		
84	„ longicolle, ..	Demerara, ...	white,	fragrant,
85	„ longiflorum, ..	Paraguay,		
86	„ longipetalum, ..	Guatemala,	purplish brown lip white and crimson	
†87	„ macrochyllum,..	„	brown and white,	less heat,
88	„ michnacanum, ..	Mexico,		
89	„ nocturnum, ..	Martinique,		
90	„ nutans, ..			
91	„ odoratissimum,			
92	„ œmulum, ..	Paraguay,		
93	„ orchidiflorum, ..	Bahia,		
94	„ ovaliflorum, ..	Mexico,		
95	„ ovulum, .	„	olive green and white	
96	„ ochraceum, .	Guatemala,	yellow,	

Epidendrum,—(Coutinued.)

No.	Name.	Country.	Colour of flower.	Remarks.
97	Epid: pachyanthum,	Guayana, ...	green and violet,	
98	„ pallidiflorum, ..	St. Vincent,		
99	„ paniculatum, ..			
100	„ papillosum, ..	..	greenish yellow and orange,	
101	„ Parkinsonianum,	Mexico, ...	green and orange,	
102	„ parviflorum, ..	Peru,		
103	„ pastoris, ..	Mexico,		fragrant.
104	„ patens, ..	West Indies,	yellow,	
105	„ phœniceum, ...	Cuba, ...	purple,	
106	„ pictum, ..	Demerara, ...	dull yellow,	
107	„ plicatum, .	Cuba, ...	green and violet,	
108	„ polyanthum, ..	Mexico,		
109	„ polystachyum,	Andes,		
110	„ primulinum, ...	Mexico,		
111	„ pterocarpis, ..	„	brownish green,	
112	„ pyriforme, ..	Cuba, ...	reddish yellow and straw,	
113	„ prismatocarpum,	Peru, ..	green and rose,	
114	„ quadratum, ..	Central America, ...	brownish green,	
115	„ radiatum, ...	Mexico, ...	purple,	
116	„ radicans, ..	Guatemala,	scarlet,	
117	„ ramosum, ..	Jamaica,		
118	„ raniferum, ..	Mexico, ...	purple spotted,	
119	„ replicatum, ..	New Grenada	yellow,	[basket.
120	„ rhizophorum ..	..	scarlet,	grow in
121	„ rigidum, ..	Jamaica,		
122	„ rufum, ...	Brazil,		
123	„ scabrum, ..	Peru,		
124	„ Schomburgkü,	British Guayana, ...	bright red,	should be suspended over water
125	„ secundum, ..	Martinique,		
126	„ selligerum, .	..	green and brown,	fragrant.
127	„ Skinnerü, ..	..	pink,	grow in
128	„ squalidum, .	Mexico,		[basket.
129	„ Stamfordianum,	Guatemala,	greenish yellow spotted,	
130	„ stenopotalum, ..	Guayana, ...	deep pink white spot	
131	„ tenuiflorum, ...			
132	„ tesselatum, .	Guatemala,	green and pink,	
133	„ umbellatum, ..	Jamaica,		
134	„ varicosum, ...	Mexico, ...	pink and crimson,	
135	„ variegatum, ..	Rio. Janeiro,		
136	„ venosum, ..	Mexico, ..	white and violet,	
137	„ verrucosum, ...	„	pink and deep rose,	
138	„ virens, ..	Guatemala,	green,	

Epidendrum,—(Continued.)

No.	Name.	Country.	Colour of flower.	Remarks.
139	Epid : virgatum, ..	Mexico, ...	green and brown,	
140	„ viridiflorum; ..	Brazil, ...	green and purple,	
141	„ viridipurpureum,	Jamaica, ...	„	tempt. does well in pot and heath soil.
142	„ vitellum, ..	Mexico, ...	orange scarlet,	
143	„ do. major, ..	„	„	
144	„ viviparum, .	Demerara, ...	same as E. *crassifolium*,	
145	„ volubile, ...	Peru,		
146	„ Wagenesi ..	Venezuela,	greenish yellow,	

Eria.

Deciduous; having for the most part small bulbs, should be cultivated either in a pot or basket, warm, humid and shady in summer and the converse in winter.

No.	Name.	Country.	Colour of flowers.	Remarks.
1	Eria abbreviata, ..	Java,		
2	„ acervata, .	India ...	white,	
3	„ acuminata, ..	Java,		
4	„ alba, ..	Nepaul,		
5	„ albido tomentosa,	Java,		
6	„ appendiculata, ..	„		
7	„ bicolor, ..	Ceylon,		
8	„ bicristata, ..	Java,		
9	„ bractescens, ..	Singapore, ...	purple,	
†*10	„ carinata, ...	Nepaul, ...	white,	
*11	„ convallarioides,	..	„	
†*12	„ densiflora, ...	Khassia, ...	white and pink spots	
13	„ Dillwynii, .	Philippines,	cream colour,	
14	„ ebulbis, ..	Java,		
15	„ erecta, ...	„		
†*16	„ excavata, ..	Nepaul,		
17	„ ferruginea, ..	India, ...	brown and pink,	
*18	„ flava, .	Nepaul,		
19	„ flavescens, ..	Java,		
20	„ floribunda, ..	Borneo, ...	white,	
21	„ grandiflora, ..			
22	„ Hyacinthoides, ..	Java,		
23	„ Jenkinsii, ..	Assam,		
24	„ longilabris, ..	..	white and purple,	
25	„ micrantha, ..	Java,		
26	„ multiflora, .	Java,		
*27	„ obesa, .	Martaban,		
28	„ ornata, ..	Java,		
29	„ ovata, ..	Philippines,		

Eria,—(Continued.)

No.	Name.	Country.	Colour of flowers.	Remarks.
*30	Eria : paniculata, ..	Nepaul, ...	green and purple,	requires
*31	„ planicaula, ...	do.		support.
32	„ polyura, ..	Manilla ...	purple and yellow,	
33	„ profusa, ..	„	.. ..	fragrant.
34	„ pumila. ..	E. I.		
35	„ pusilla, ..	Khassia Hills		
*36	„ ramosa, ..			
37	„ robusta, ..	Java,		
38	„ rosea, ..	China,		
39	„ rugosa, ..	Java,		
†*40	„ stellata, .	„		
41	„ sulcata, ..	„		
42	„ vestita, ..	Singapore,	red and white,	

Eulophia.

A Terrestrial Orchid.

No.	Name.	Country.	Colour of flower.	Remarks
1	Eu: articulata, .	Guinea,		
2	„ atrovirens, ...	East Indies,		
3	„ barbata, .	Cape of G. H ,	white,	
4	„ bractescens, ..	Chittagong,		
* 5	„ campestris, ..	Oudh,		
6	„ carinata, ..	Malabar,		
7	„ concolor, ..	Bourbon,		
8	„ ensata, .	Cape,		
9	„ explanata, ..	Ceylon,		
10	„ graminea, ..	Singapore,		
11	„ grandiflora, ...	Ceylon,		
12	„ guiniensis, ..	Sierra Leone,		
13	„ herbacea,	Ceylon,		
14	„ hians, ..	Cape,		
15	„ lamellata, ..	„		
16	„ longicornis, ..	„		
17	„ lurida, ..	„		
*18	„ macrostachya ..	Ceylon, ...	green & yellow,	
19	„ Mackayana, .	Brazils,	green brown purple,	
20	„ micrantha, .	Cape of G. H.,		
21	„ nuda, ..	East Indies,		
22	„ Promensis, ..	Burmah,		
23	„ pulchra, ..	Bourbon,		

Eulophia,—(*Continued.*)

No.	Name.	Country.	Colour of flowers.	Remarks.
24	„ ramentacea, ..	East. Indies,		
25	„ rupestris, ..	Nepaul,		
26	„ scripta, ..	Madagascar,		
27	„ streptopetala, ..	S. America,		
28	„ tristis, ...	Cape of G. H.,		
*29	„ virens, ..	Madras;		

Ephippum.

A Java Orchid, 2 species mentioned by Lindley.

Echioglossum.

A Java Orchid described by Lindley.

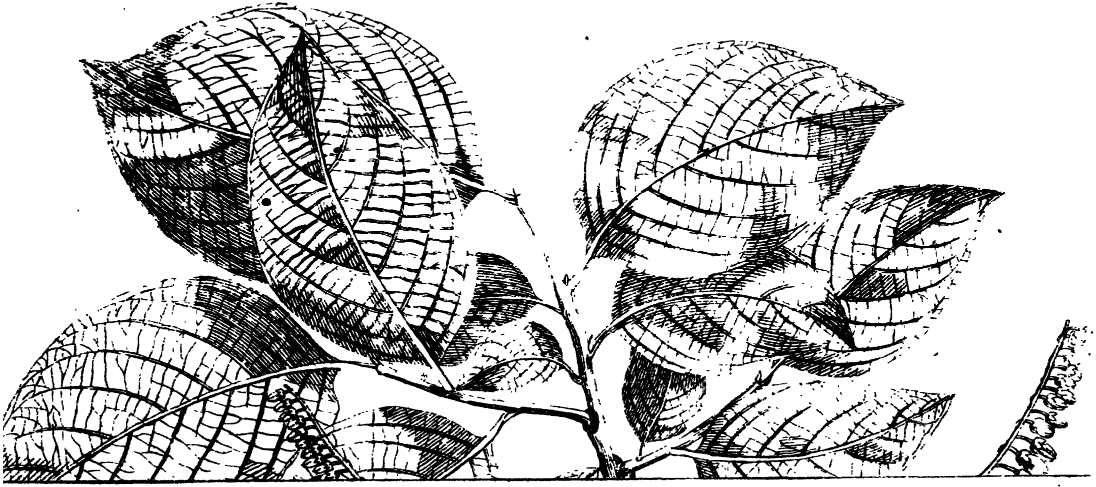
Orchids marked thus (*) are in the Calcutta Botanical Gardens.
Orchids marked thus (†) are in the writer's collection.

(*To be continued.*)

Note on the poisonous properties of certain species of Andromeda.

By Dr. HUGH CLEGHORN.

It is instructive to note every fact illustrating uniformity of action pervading a family of plants, it may therefore be useful to direct attention to the following passage in the *Gardeners Chronicle* of 17th March 1866, page 256, describing the poisonous effects upon a flock of sheep, of *Andromeda floribunda*, a shrub introduced into England :—" Mr. Deacon of Mapledon, has recently lost no fewer than 18 sheep through their eating a poisonous shrub. It appears that a short time ago the gates leading into the pleasure grounds were left open, and 38 sheep which were grazing in a field near strayed into the grounds, and while there they ate ravenously of *Andromeda floribunda*, a most poisonous shrub from North America,



Mr. Hewitt the bailiff, at once treated the sheep, 37 of whom showed symptoms of poison, and then called in Dr. Gregory, and under their united treatment 19 of them recovered."

To those who have lived at any of our Himalayan stations, it is probably known that the young leaves of the *Andromeda ovalifolia* poison goats; the deleterious action was first alleged by Doctor Wallich, who figured this tree in the Asiatic Researches Vol. XIII p. 391, giving a communication from Dr. Govan then (1820) Superintendent of the Botanic Garden at Saharunpore. "Your '*Andromeda ovalifolia*' occurs first on the hills between Nahun and Sabhatoo, at an elevation of about 5,000 to 8,000 feet, after which it becomes rare and soon disappears entirely. It is called *Aiaar* or *Airee*, and grows to a tree of 20 to 40 feet in height; the bark of the stem and older branches is much cracked and rough, that of the former almost suberose. With regard to its use, the same opinion prevails here as in Sirinagur, an infusion of the bruised leaves in water being considered a specific against cutaneous complaints of a herpetic nature both in the human species and in cattle; its operation is said to be attended with considerable pain. Sheep and goats eat the leaves which, when young, produce soporific and deleterious effects on them. When used as litter, they are said to destroy insects in the stalls of the cattle."

The tradition of the poisonous character of the *Andromeda* prevails every where from Nepal to Khagan and I have myself seen the stimulant and deleterious effects produced on sheep and goats both at Simla, where the tree is known as *Ayar** and at Dhurmsalla where the vernacular name is *Eliyoon*. The tree is common along the whole outer range of North West Himalaya and is usually associated with *Rhododendron arboreum* and *Quercus incana;* the wood is used for the manufacture of charcoal. In the valley of Khagan, the local name is "Ratankat" which signifies "blood killer." At one of the Hill Sanitaria, a municipal commissioner proposed that all the trees of this species should be cut down on account of the injurious effect upon sheep imported from the plains. It is remarkable that the young shoots only are deleterious, the old leaves are not poisonous and the sheep of the Hills do not appear to suffer.

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* In Nepal *Angiar,* perhaps from the Sanscrit "*androgyukar*" causing sickness: the young leaves being very poisonous to sheep and goats The honey is also considered very deleterious. (*Madden in Js. As. Soc. Beng. Vol.* 17, *p.* 365.)

In the Diary of Major Marshall, when passing through Sirmoor in the outer Himalaya 1827, the following passage occurs :—"Our flock, but especially the goats, were affected with a violent vomiting, occasioned by their eating a shrub which grows about pointed out to us by the Zemindars, who call it 'Oowar.' They gave them water, which cured some of them." *(Cal. Jour. Nat. Hist. VII.* 544.*)*

The Rhododendron tribe exhibit more or less of these deleterious properties, thus R. *ponticum*, *maximum*, *ferrugineum*, *chrysanthemum*, are poisonous to cattle which feed upon them; *Ledum latifolium*, more stimulant, is used as tea (Labrador tea) but determines to the head; *Kalmia latifolia* is accounted poisonous, honey collected by bees feeding on it is of a deleterious nature, as is that of *Azalea pontica.* (Royle's Ill. p.259.) On refering to Dr. Torrey's Flora of New York which contains much useful information regarding the properties of North American plants, I find the following remarks upon species of this family :—

Andromeda mariana, Kill Lamb or stagger bush. It is supposed to be poisonous to lambs and calves, producing a disease called the staggers.

Kalmia angustifolia, sheep Laurel. This plant is believed to kill sheep and other animals. In some places, it is called *Sheep poison* and *Lamb Laurel.*

Explanation of Plate.

Andromeda ovalifolia,

a. Flower, *c.* Stamens,
b. Corolla opened, *d.* Corolla removed,
All the parts magnified. *e.* Fruit,

Note.—Dr. Wallich's figure is here reproduced with the fruit added. The plant is the *Andromeda capricida,* Hamilton M. S. and *Pieris ovalifolia,* Dons. Gard. Dict iii. p. 832.

Notes upon the Pines of the North-West Himalaya.

By Dr. H. CLEGHORN.

IN the Journal of the Agricultural and Horticultural Society of India (Vols. iv, vii and viii, 1845 to 1854) is a series of papers entitled, "Observations on some of the Pines and other Coniferous trees of the Northern Himalaya," by the late Colonel Edward Madden of the Bengal Artillery, founded upon personal remarks made during journeys into the interior of Kumaon, Gurhwal and Bussahir, with references to the records of Himalayan travellers, which he had carefully studied. This valuable contribution to Forest literature has been much consulted in later years, since the Deodar and other Himalayan trees have risen in value and importance. A brief Synopsis of the North Indian Conifers will be found at the end of Hoffmeister's travels, but this work is not easily accessible and several inaccuracies have crept into the posthumous publication of that lamented Botanist, whose career was suddenly ended on the battle-field of Ferozeshah.

In my report upon the Forests of the Punjab and Western Himalaya (1864), are occasional remarks upon the properties and Geographical distribution of these important trees, and in the more recent survey reports of Dr. Brandis on the Bussahir Forests (1865) and of Dr. J. L. Stewart on the Forests in the Chamba Territory (1866) is much valuable matter regarding the habit, appearance, growth and nomenclature of the several species in different localities. Within the last few years our acquaintance with the Pines of Central Asia has been much increased and it will soon be advisable to bring together a concise account of all the more valuable

Forest trees of the Himalaya, including a notice of the working qualities of the timber and economic uses of the several species, which the increasing experience of Public Work Officers will ere long enable them to furnish.

Meanwhile the difficulty experienced by many intelligent Officers in distinguishing with certainty the various Coniferous trees of the Himalaya, has often been remarked and regretted; and as accuracy of discrimination is a matter of practical importance to Forest Officers, Executive Engineers, and others, a synopsis, giving shortly the essential characters of the Pines occurring in the North-West Himalaya, has been prepared for general information.

Close attention to Native names is of great moment, but too implicit reliance must not be placed on them. It will be seen that *chil* or *chir* is applied to *Pinus longifolia* in Chumba, Sirmoor, &c., and to *Pinus excelsa* in Gurhwal. Again, "Deodar" denotes the twisted Cypress (*Cupressus torulosa)* in Kullu, the Himalayan Cedar (*Cedrus Deodara)* in Kashmir, Gurhwal, &c., and the tree Juniper in the valley of the Upper Chenab; each of these trees being objects of veneration in the districts where they predominate.

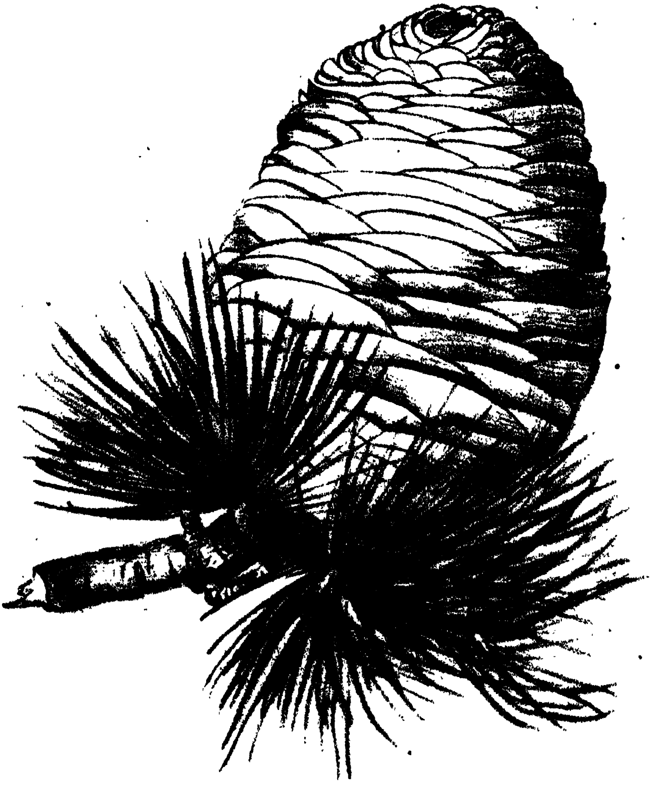
The list of local names and synonyms has been prepared with care. The names in Chumba, Kullu, Bussahir, and Hazara have been verified by Dr. J. L. Stewart, who has contributed so much to our knowledge of the Punjab Flora. In Kumaon and Gurhwal, Dr. Jameson's and Colonel Madden's names are given. In Kashmir, the names of Moorcroft and T. Thomson are always reliable, and those of Vigne may be added to make the list more complete.

The table of ranges of elevation and supposed average height and girth, is intended to give a general idea of the distribution and the size these trees attain under ordinary circumstances. The figures of the cones are expected to be useful. It is requested that any errata or addenda which may come under the notice of observers may be reported to the writer of this paper.

Nº 1

CEDRUS DEODARA

Natural size

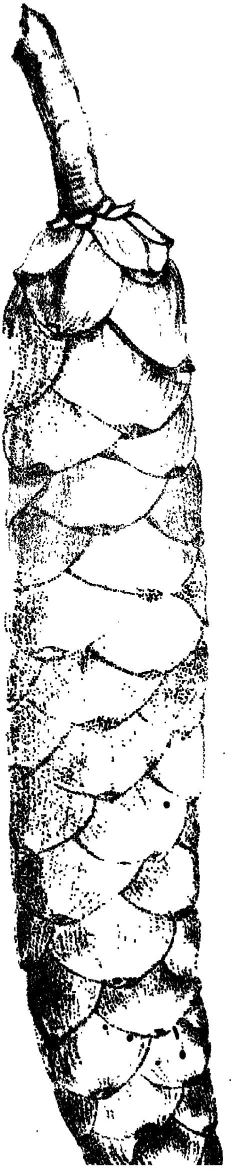


No. 2

PINUS EXCELSA

(Lofty Pine)

2/3ds natural Size

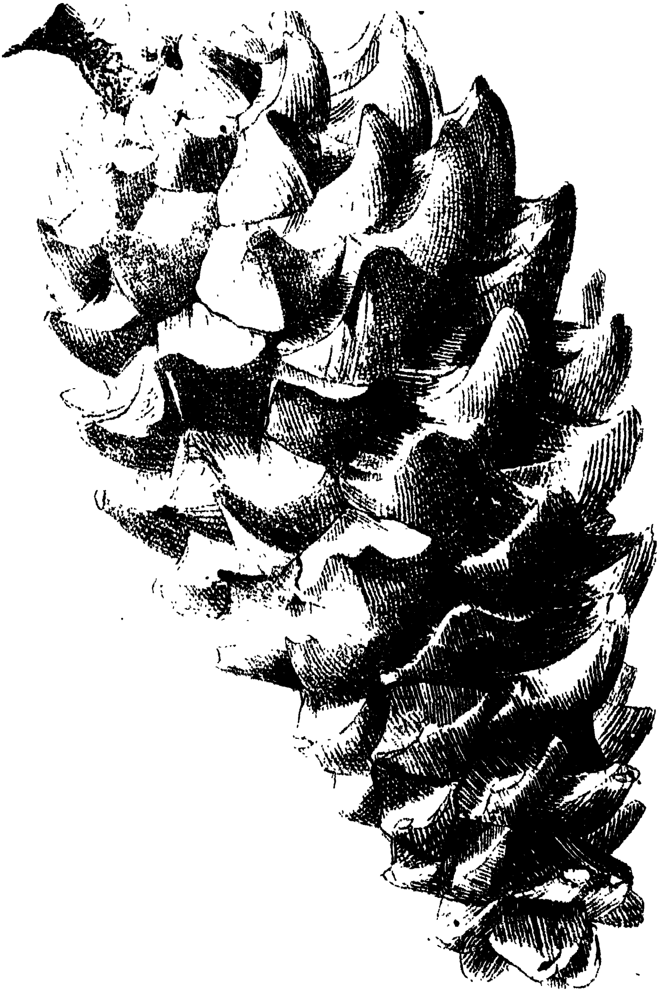


Nº 3

PINUS LONGIFOLIA

(Long leaved Pine)

Natural size



Analytical key of the Conifers of the N. W. Himalaya.
BY DOCTORS H. CLEGHORN AND J. L. STEWART.

	CEDRUS DEODARA. *Deodar* or Cedar. I.	PINUS EXCELSA. lofty pine II.	PINUS LONGIFOLIA. long leaved pine. III.
Shape and habit of tree and branches, &c.	Tree pyramidal and low branching. *Branches* straight, and spreading nearly horizontally from trunk, and their extremities either horizontal or slightly drooping. Trees frequently several trunked, and often table-topped,	Tree conical or ovate and low branching. *Branches* long, and tending to horizontal, their extremities always feathery, and a little upturned, unless when weighed down by the cones.	Tree ovate when young, and long ovate with broadish top when old, high branching. *Branches* springing rather symmetrically from trunk near which they droop, extremities up-curved.
Colour.	Darker than all except VI when old; of a very light bluish green when young.	Rather light or bluish green; often with a gray tinge (*grisatre*) when near its high limit.	Dark green when old, young trees occasionally of a lighter yellower green (and with shorter leaves).
Bark.	Thick, dark and rather smooth, longitudinal fissures dividing it into long narrow plates.	Thin, darkish, and tolerably smooth, with furrows dividing it into irregular small plates.	Rough, and divided into large longitudinal plates, of a gray color, by deep, irregular, longitudinal seams.
Leaves.	An inch or more long, three-sided, sharp, needle-like. thinly scattered all round the new shoots, or in tufts of 40 to 50.	Six or 7 inches long, very slender and drooping, in clusters of 3 to 5, (generally 5) without a sheath; or short and *stumpy* when tree is near its upper limit.	Six to 18 inches long, stiff and erect, in clusters of 3, each with a woolly sheath of a half to one inch long.
Cone or berry.	*Cone* erect, cylindrical, 4 inches, long and very thick, darkish brown. *Scales* thin, closely applied and deciduous. Ripe October.	*Cone* pendant, 8—13″ long, slender, pea green or bluish green, often resinous when young. *Scales* thickish at end, persistent. Ripe, October.	*Cone* shortish and thick, 5″—7″ long, 12″ in girth, on short stalks and growing stiffly from all sides of branches; brown. *Scales*, much thickened, knobby at points, and persistent. Ripe October.
	Note.—The Deodar may be recognised by its tabular branches and ovoid *erect* cones. It is the *Larch* of Fraser and other travellers.	*Note.*—Resembles *Pinus Strobus* or the Weymouth pine. The bark leaves and cones are very distinct.	*Note.*—The Chir is known by its rough bark 3 leaves and picturesque head.

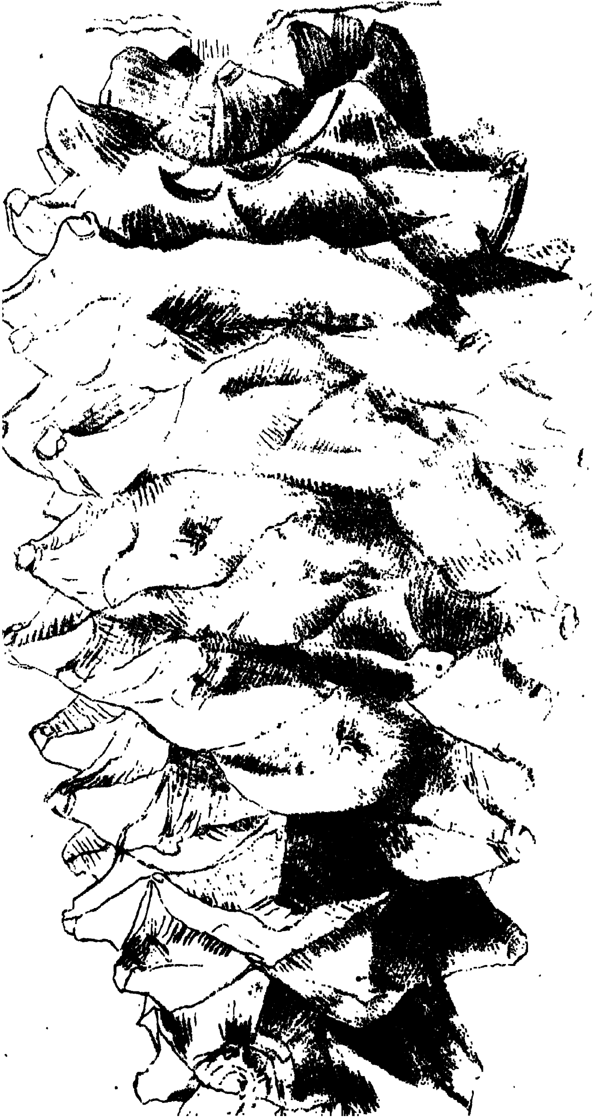
	Pinus Gerardiana, Gerard's pine. IV.	**Abies Smithiana.** spruce. V.	**Picea Webbiana.** silver fir. VI.
Shape and habit of tree & branches, &c.	Tree ovate and like III. but shorter, more bushy and conical at top, ordinary height 30, to 40'. *Branches* straggling and not so symmetrical as those of III; extremities much up curved.	Tree tall and narrow, *branches* sloping downwards or nearly horizontal, with depending tassel-like twigs all along, the extremities bushy.	Tree tall, very narrow, & cypress like. *Branches* short, thick, scrubby, and declining at extremities.
Colour.	Darker than II. and lighter than I, with gray branches shining through.	Lighter than I, and about same as II, but rather darker tinge.	Darkest of all; near its upper limit is grayer, and like V, in appearance.
Bark.	Furrowed into long, very large greenish gray flakes, which peel off and show the dark surface below.	Smoothest of all except the yew, tesselated into small squares by shallow furrows.	Smoothish, tesselated by shallow furrows into small squares; young branches silvery.
Leaves.	Three inches long, stiff, glaucous, in clusters of 3, with no sheath.	About an inch and half long, sharp pointed, stiff, solitary, and thickly scattered round branches and twigs.	Two inches long, flat, with 3 small points, in two rows on either side of branches and twigs.
Cone or berry.	*Cone* like that of III, (6 inches long), but thicker; bluish *Scales*, thickened at ends, with spinous apex persistent. Ripe October. Seeds edible, flavor agreeable.	*Cone* pendent from tips of branches, oblong, cylindrical 6—7 inches long, brown or purple. *Scales*, thin with membraneous edges, persistent. Ripe October.	*Cone* erect, rather short, cylindrical, dark purple. *Scales* broad, dark-coloured near edge, deciduous. Ripe October.
	Note.—The edible pine is known by the cones and bark.	*Note.*—Distinguished by its pendulous branchlets and cones, often called the *Weeping* pine.	*Note.*—The sombre foliage, silvery bark and purple cones are characteristic of this tree.

Nº 4

PINUS GERARDIANA

(Edible Pine)

Natural size

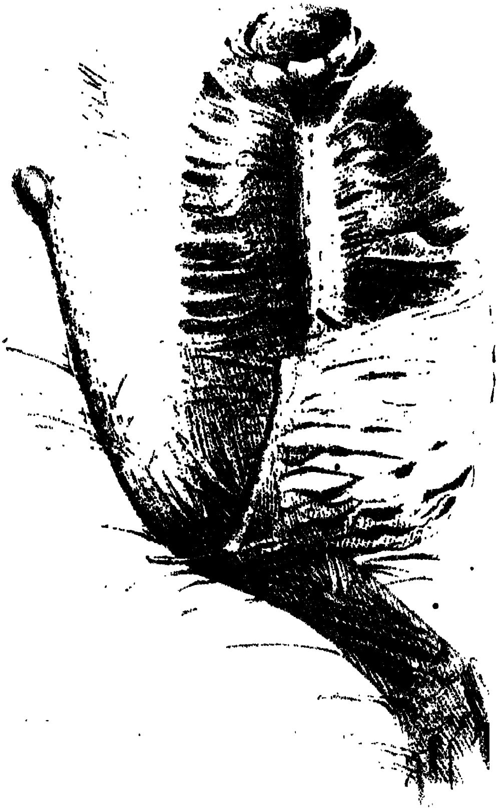


No. 6.

PICEA WEBBIANA

(Himalayn Silver Fir)

Natural size



	CUPRESSUS TORULOSA, twisted cypress VII.	TAXUS BACCATA, yew, VIII.	JUNIPERUS EXCELSA, pencil cedar. VIII
Shape and habit of tree and branches, &c.	Tree an elongated cone, like garden cypress and VI, but broader than latter. Young trees graceful like young I, with declining branches. *Branches* of old trees nearly horizontal with up-curved tips, young twigs spring laterally from boughs.	Tree short. straggling, and trunk soon dividing. *Branches* flexible and drooping.	Tree 20 to 30′ high, cypress-shaped, shorter trunked than II, and *branches* more up-curved and bushy.
Colour.	Young trees bluish-green; old ones darker, with brownish tinge.	Moderately dark green.	Resembles II, but grayer, not easily distinguished at a distance.
Bark.	Smooth brownish, leathery-looking, with long darker strips peeling off, often spirally, whence the specific name,	Very smooth, light brown; young branches silvery.	Smoothish, peeling off in strips.
Leaves	As of cypress, mere scales closely laid over each other, generally in 4 rows	As of VI, but shorter, flatter, and single-pointed.	As of cypress.
Cone or berry	*Cones* as of cypress, ¾ of an inch long, sub-globular, of 10 clustered *scales* with facets	*Berry* small, red, Ripe October.	*Berry* dark purple, resinous flavour.
	Note —A rare tree in the Himalaya, probably the wild state of the common Cypress.	*Note*—The Himalayan yew is identical with the common yew of Europe	*Note.*—The sacred Juniper of Kumaon and Tibet *

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* Two other species of Juniper occur *Juniperus recurva* and *Wallichiana*, but they are depressed shrubs, and are therefore omitted.

Local names of Conifers of North-West Himalaya,

	Pushtū.	Huzārā.	Kashmir.	Chumba (Chenāband Ravi Division)	Kúllu (Bais Division.)	Busssahir (Sutlej Division.)	Gurhwāl and Kumaon.
Cedrus Deodara. (Deodar or Cedar,) ..	—	deodār diār. palūdar	deodar diār	kalein kilei kelù, keli kilār dadār, diar	kelù keli keori	kelu kiali keiwal kelmung gyam, *Tib.*	deodār diar
Pinus excelsa. (Lofty pine) ..	lmanza pinni *Kafir*	biar	chil, chir biār yāri	chil, chil chili, tser lhem, lhim yār	keil	chil lim Kail	keil kail chil darchilla
Pinus longifolia. (Long-leaved pine) ..	nakhtai	chil chir	chil	chil	chil	chil	sulla saral chil
Pinus Gerardiana. (Gerard's pine) ..	chilghoza	—	neoza	jalgojā galgojù mirri kashti	—	ri rhi. shangti *Tib.*	
Abies Smithiana. (Himalayan spruce) ..		kachan	kachal	tos. tosh rāo, re rāg kauli	rai	re raiang ro rou	rai roi tea *Bot.*

Tos usually denotes the *Picea*, and *rai* the *Abies*, but in Chumba it is reversed.

Picea Webbiana. (Silver fir) ..		—	rayal		—	krok pindrow pindrai tbunera chilrou khatrou spun	morunda ragha raisalla ooman *Bot.*
Cupressus torulosa. (Twisted cypress) ..	—	—	—	debidiār	deodār	galla gallain kallian	leaur soorye
Taxus baccata. (Yew) ..	sarāp ? badar	birmi tùng	sangal tung tùni postil	dhono chogù kautù barma	rakhal	thona kadeurù rikhal yamdal sungcha ?	tuner.
Juniperus excelsa. (Pencil cedar) ..		charāi		lewar, leor, sbur, devdār		shùr shurgù shukpa *Tib.*	lewar newar dupri chundun.

Note.—The bewildering confusion of the vernacular names, which has existed since the time of Pliny, may reconcile the traveller to the comparative unity of Botanical nomenclature.

PINES OF THE N. W. HIMALAYA.

Table showing the approximate range of elevation at which the Pines grow, and the supposed average height and girth they attain under ordinary circumstances.

NAMES.	RANGE OF ELEVATION.	HEIGHT. ATTAINED UNDER ORDINARY CIRCUMSTANCES.	AVERAGE GIRTH AT 6 FEET FROM GROUND.
		Feet.	Feet.
I.—*Cedrus Deodara.* (Deodar or Cedar)	Gurhwal to Afghanistan, 5,500 to 10,000 feet.	100 to 150	8 to 10
II.—*Pinus excelsa.* (Lofty Pine)	All parts of the Himalaya at 6,500 to 10,000 feet. 11,000 feet in Kumaon.	100 to 120	5 to 10
III.—*Pinus longifolia.* (Long-leaved Pine)	Dry exposures from 1,500 to 6,000 feet. Covers large tracts of the outer hills.	49 to 90	5 to 8
IV.—*Pinus Gerardiana.* (Gerard's Pine)	Drier valleys from Afghanistan to the Sutlej, 6,000 to 12,000 feet.	30 to 40	4 to 5
V.—*Abies Smithiana.* (Himalayan spruce)	All parts of the Himalaya at 7,000 to 12,000 feet.	120 to 150	10 to 12
VI.—*Picea Webbiana.* (Silver fir)	The most alpine of the pines, 8,000 to 12,800 feet.	100 to 150	10 to 12

VII.—Cupressus torulosa. (Twisted Cypress)	One of the rarer Pines. From Sikkim to the Ravi, 6,000 to 10,000 feet.	100 to 150	5 to 10
VIII.—Taxus baccata. (Yew)	Many parts of the Himalaya Khagan to Assam 8,000 to 11,000 feet.	20 to 30	5 to 10
IX.—Juniperus excelsa. (Pencil Cedar)	Lahoul and Tibet 9,000 to 12,000 feet.	18 to 30	2 to 5

NOTE.—The figures do not give the extreme ranges of elevation at which the Pines are found to grow, but indicate the supposed limits of healthy development; the dimensions given are believed to represent approximately the average height of stem and girth of butt attained under ordinary circumstances. These conifers are found in the British possessions and Protected States lying between Afghanistan and Nepal, the Kabul and Kali Rivers limit the area embraced in this paper. The drawings of the cones were made by Colonel M. Biddulph, R A., except those of *Cedrus deodara* and *Pinus excelsa*, which were delineated by W. Coldstream, Esq., C. S. Nos. iii. iv, v, and vi are figured in Royle's Illustrations of Himalayan Botany Colonel Madden, in the Journal of the *Agri-Horticultural Society* of India iv. p. 269, has given the following measurements of exceptional trees.

No. MEASURED	SPECIES.	LOCALITY.		AVERAGE GIRTH
10	*Cedrus deodara*	Annandale	Simla	10 feet.
25	*Ditto* ———	South water-fall		11 ,,
10	*Abies Smithiana*	Hill States		16 ,,
10	*Picea Webbiana*	Ditto		14½ ,,

The cone of *Picea Webbiana* No. vi, had partly fallen to pieces before it was sketched.

The following synonyms of the Himalayan pines given in the posthumous papers of Griffith may be noted :—

Pinus excelsa, = Pinus pendula
Abies Smithiana, = Abies densa
Picea Webbiana, = —— spinulosa

The following names occur in the catalogue of Jacquemont's plants (*Voyage a l'Inde par Victor Jacquemont*, 1828 *to* 1832,) published by the French Government :—

1. Cedrus deodara, = Larix deodara
2. Pinus excelsa, = Pines attenuata
3. —— longifolia, = —— longifolia
4. —— Gerardiana, = —— Gerardiana
5. Abies Smithiana = Abies circularis
6. Picea Webbiana, = —— complanata
7. Cupressus torulosa, = (not observed)
8. Taxus baccata, = Taxus Nipalensis
9. Juniperus excelsa = Juniperus arborea.

The Synonyms of the oaks and chestnut mentioned by Jacquemont appear to be :—

1. Quercus incana, = Quercus castanoides
2. —— dilatata, = —— protea
3. —— semicarpifolia, = —— diversifolia
Pavia Indica, = Aesculus hippocastanum.

Note.—In Dr. Brandis' report upon the Deodar Forests of Bussahir, page 12,—some interesting facts are given relating to the periods which the different species of Pines retain their leaves.

	Years.
Picea Webbiana, ...	8 to 10
Abies Smithiana, ...	
Cedrus Deodara, ...	.. 5
Pinus excelsa, ...	.. 4
Pinus longifolia	2 to 3
—— *Gerardiana*, ...	

This peculiar character of the foliage indicates the requirements of the different species regarding light and shade. *Picea* and *Abies* thrive in more close and dark forests than *Pinus longifolia* and *Pinus Gerardiana*. These facts merit attention, and as Dr. Brandis remarks have important practical bearings.

Experimental Cultivation of Carolina Paddy in Bengal.

In May and June 1866 the Society received from the Agricultural and Horticultural Society of Madras, 30 seers of acclimatized Carolina Paddy, and from Dr. Forbes Watson of the India Museum 20 seers of imported seed. Both kinds were distributed in small quantities to 15 applicants. The following returns from four of these applicants prove how successfully this fine description of Paddy can be grown in Bengal.

Report by Mr. Joseph Agabeg.—The Carolina Paddy you gave me, imported and Tinnevelly acclimatized, of each 2½ seers or 5 seers in all, was sown by me in my ground, at Fairy Hall, Dum Dum, and I now have much pleasure in sending you specimens of both for inspection at your next meeting.

The plants raised from the above were sown in the middle of July or rather transplanted in a spot not measuring, I believe, even half a beegah, which is a mistake as they were too near each other, and it ought to have been on one beegah, so that we could make a proper calculation what one beegah of well cultivated and well manured land in Bengal would produce. But by a guess I think my 7 or 8 cottahs must produce 3 to 4½ maunds, and as my ground was not well prepared or manured, I think well cultivated and well manured land will produce from 14 to 16 maunds at least, and I believe this is the highest and largest production any soil in Bengal has given from the ordinary or indigenous country paddy.

The imported Carolina has not grown so tall as the Madras acclimatized, but the grain I think larger and perhaps the Paddy if made *Oosna* (boiled) will be a very superior Rice. It has one advantage over the other, and this is, that in heavy rain or in bad weather when blowing very hard, as on the 24th October, it does not tumble down like our country paddy or even the Madras acclimatized, which was affected by the violence of the wind on that day, though not half so much as the ordinary Paddy of Bengal (of which I have sown several descriptions this year for trial). The reason is, I believe, that the Carolina in proportion to thickness of stalk, is very short, and safer in consequence, when it gets ripe and the top gets heavy, especially in an October gale or heavy rain at the close of the rainy season. There is another advantage in the imported Carolina, and that is, that it takes much less time to grow than the country or even Madras acclimatized; and I believe it will answer for both crops the *Ouse* and *Kartick* (August and October.) I would strongly recommend our Society importing in 1867 to arrive here in April, at least 100 maunds; not to be distributed to Members freely, but sold to them or given to them at cost price.

Fairy Hall, Dum Dum: *Wednesday 7th November*, 1866.

The imported has an advantage over the acclimatized in coming to maturity a month earlier; a great desideratum when the land is required for a cold weather crop.

Report by Major E. Wintle, Cantonment Magistrate, Dum-Dum.—A few days after I received the seed (two and half seers of each) I put it into seedbeds and when about a foot high transplanted the young plants five or six in a bunch, taking great care that the two sorts should not be mixed up. Although all germinated freely a small quantity of the seed was lost by being carried off by sparrows, and a little bird called the tailor bird, I believe from their peculiar nests. Just before sowing the seed we had some wet weather and the grounds being cloggy it could not be properly covered; it was this portion that was carried off.

Yield.

The imported was transplanted into a piece of ground measuring seven (7) cottahs, and the acclimatized into a piece of eight and a half (8½) cottahs, and the produce was thus of paddy, Imported one maund two seers, acclimatised three maunds seven seers. Of straw there was imported, thirteen Puns,* acclimatised, two kahuns two puns.

There is a striking difference in the yield of the acclimatized over the imported but this I attribute to the comparative poorness of the soil in which the latter was transplanted, for both patches received the same treatment as regards working.

Difference in yield accounted for.

In the imported patch also one portion was higher than the rest, but, although levelled, it still remained slightly higher, and here the growth was scanty; in another portion a "babool" tree had been cut down, and here also the growth was scanty for some yards round the spot. However in the better spot it never equalled the acclimatized.

The acclimatized patch was of one level and better quality, and not having the same drawbacks to contend against, the plants were all of an equal growth, and certainly a more magnificent crop I have never seen, it was a sight I enjoyed and well repaid me for the labor bestowed on it.

There is an advantage over the country crops, which both sorts possess, and that is its perfect immunity from being affected by bad weather, for when after the blow on the 24th October last the country crop was laying in heaps, both imported and acclimatized reared their proud and graceful heads, bidding defiance to both wind and rain.

Advantages over country crop.

This advantage also creates another, and that is labor is economised, for it takes time to collect a sheaf when it is laying in all directions.

These advantages I consider alone stamp both sorts as *the* crops for Bengal and that call for more extensive introduction considering the weather we are subject to during October.

I send samples of both paddy and straw of each kind, and to make my report as complete as possible also some rice of both sorts.

Samples.

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* 80 Bundles 1 Pun, 16 Puns 1 Kahun.

Rice.

Yield.

I had some of the paddy husked and the result was as follows:—five seers imported yielded three seers nine chittacks of good rice and the same quantity of the acclimatized three seers one chittack and a half.

Compared with country produce.

Here again is another advantage over the country for, from enquiries I have made, it appears that native paddy produces only fifty per cent of rice at the *utmost.*

Straw.

I must not forget to mention the straw also. At home it is now an acknowledged principle not to allow the straw to ripen too much, by which not only is there a loss in the seed dropping, but cattle will not so readily devour it. This plan I have adopted as will be seen by the couple of sheaves I send, and the scent is more that of oat hay than straw; the "proof of the pudding is in the eating," for my horses and cattle eat it with immense gusto when converted into chaff.

Best mode of cooking rice.

The rice we have tasted and we consider it far superior to the country. The way to cook it is just to put sufficient water to boil it, when it comes out in a mass, retaining all its nourishing properties, whereas native cooks, deluge it with water and when cooked, throw away the water, "Peech" as it is called, thereby losing the actual essence of the grain.

Slight manuring recommended.

Its cultivation requires no comment, as this is well known, but a light manuring improves the crop.

The sample of the imported straw is rather a bad one, for the generality of the crop was higher, but this was the only one secured.

I think I have said enough now, and I trust that my observations may affect its extensive introduction and cultivation.

There is a fly very offensive in smell, that attacks paddy in its juicy state, and completely drains the husk of its milky

Ravages by Insects. substance, the natives call it "Gundee" but they have no remedy against its attacks. This fly also attacked the Carolina, as shown in the first specimens I sent down; fumigating the crop with dried *Neem* leaves burnt in dried cowdung fires might possibly drive them off.

DUM-DUM: 17*th December*, 1866.

Report by Mr. T. T. Allen, Magistrate of Tipperah.—As my Carolina paddy has been now gathered in, I am in a position to give you an account of the result of the experiment. If you think it of sufficient interest to communicate to the Society you are at liberty to do so.

The quantity of seed received from the Society was 2 seers of imported and 3 seers of acclimatized, but before sowing I lost about half a seer by an accident.

On the 27th June, I sowed the first lot consisting of something more than half of the acclimatized and half of the imported seed, and on the 6th of July, I sowed the remainder.

On the 29th July the batch first sowed was transplanted into ground, well manured and flooded; the depth of water was not more than 3 inches.

In transplanting, instead of putting about a dozen plants together as the natives do, I put never more than two, and latterly only a single plant. The intervals at which the plants were set, was on an average 9 inches. This, as you may suppose, obliged me to cover a good deal of ground, so that the imported seed took up ⅝ of a begah of 1,600 square yards and the acclimatized occupied one begah.

Both kinds throve exceedingly well and nothing could be more healthy than the appearance of the plants. The imported seed however was more rapid in its growth, and on the 23rd September the plants from this began to flower. When the grain began to set it was attacked by the *Mewah* insect and I should think about ⅝ of the produce was thus destroyed. The batch of imported seed which was set a fortnight later also suffered from this cause. The total produce obtained from the 2 seers of imported seed was 1 ½ maunds, but no fair opinion can be formed from this. I am quite sure that but for this unforeseen accident and a mistake as to the quality of the soil where I planted out the 2nd batch, which had been rendered black not from manure as I supposed, but from refuse charcoal which had been thrown there, as I afterward learned —the produce would have been even larger than from the acclimatized seed. Certainly the appearance of the plants before the insects attacked them was much more promising.

From enquiries which I have made, I learn that this *Mewah* insect destroys any *dhan* that flowers between the beginning of Septr. and the middle of Octr. Consequently in future experiments, taking into consideration the more rapid growth of the plants from imported seed, it would be necessary to transplant them about a fortnight or three weeks later than I did, or else to set so early that the grain might be hardened well in the early part of Septr. I think this imported seed might very well be sown as a *Satya* crop to ripen where sown without transplanting. In that case it would certainly escape the insects, but it may require more water than generally fall to the lot of *Satya* dhan. The first batch from imported seed was ripe for cutting on the 24th Octr. the rest about a fortnight later.

As to the plants from acclimatized seed they began to flower on the 23rd Octr. and were ripe for cutting on the 2nd Decr. The produce of the 3 seers of acclimatized seed was 7¼ maunds of dhan. When the quantity of seed is considered this result will I believe be thought successful. In planting out at such intervals and only single plants, I was anxious to secure the maximum of produce from the seed, without regard to the extent of land, but of course an agriculturist finding seed cheaper than land would direct his attention to securing the maximum of produce from a small *extent of land.*

My aim was to develope the individual plant and I believe I have been successful. From a single seed I counted as many as 14 flower bearing stalks and the average number was certainly not less than six. The natives who have seen the paddy growing have been apparently struck with it and would gladly try some themselves next year. They prefer the acclimatized to the imported, however this is perhaps owing to the accidental injury which the latter sustained.

To appreciate this experiment it would be necessary to have some facts relative to the quantity of seed which the natives use on a begah of land and the amount of produce they obtain, in order to institute a comparison. I have been told that for this winter crop which is transplanted, half a maund of seed is required for one begah, and the produce under the most favourable circumstances would amount to fifteen maunds. But I cannot say whether this is a correct statement. Little reliance can generally be placed on native figures. I should be glad if any Member of the Society could give me some reliable data.* From what I have seen of this rice, if growing it for profit I would use about 10 or 12 seers of seed on a begah of land; and if the land was well-manured and flooded six inches deep I should expect about 20 maunds of *dhan*; but after all this is mere guess work. The plants may not bear crowding as well as the native kinds. I may mention that I dug up a single plant just before flowering, the roots spread in a circle about 20 inches in diameter and were very numerous and strong looking. I will send you some of the heads of dhan from acclimatized seed for comparison.

The ones selected are somewhat above the average, and I

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* *Extract of a letter from Baboo Shib chunder Deb.*

One beegha of land requires 12 seers of paddy for sowing, and produces on an average 8 maunds of paddy, and 1¼ kahuns of straw: 8 maunds of paddy will give about 6 maunds of rice.

The chief kinds of paddy grown in the suburbs of Calcutta are: Ramshahi, Rajmohun, Dukhine Bangee, Saban, Kalindee, Meghee, Paniturash, Benakata, Hurkooleo, Metya, Kocho, Bakooe, Matchal, found on weighing that 126 such with one inch stalk weigh one seer.

TIPPERAH: 19*th Decr.* 1866.

Report by Mr. C. E. Blechynden.—I received from the Society 6 seers of imported, and the same quantity of acclimatized seed. I sowed them at Menah Khan in the Soonderbuns, one of the Estates of the Port Canning Company. The acclimatized did not germinate freely; the imported sprouted in the proportion of 75 per cent. In both descriptions there seemed to be an admixture of seeds of different seasons. The seed was sown in the latter part of June and transplanted in the middle of July. The return from the acclimatized was about 10 seers, that of the imported gave in the proportion of 35 seers to the cottah or 17½ mds., per beegah. I planted out 8 cottahs of land with the imported. From the sudden cessation of rain for a time in the latter end of July, the plants suffered in their first growth; but for this I have no doubt the yield would have been much greater.

21*st January* 1867.

Directions for cultivating Carolina Paddy.

Sow in a seedbed as soon as the rains have fairly set in. By seedbed I mean the way in which the Natives prepare the young plant for transplanting. The ground in which the paddy is to grow should be well manured and the dams all round raised, as this kind of paddy requires water always at the roots, and that some 4 or 5 inches deep. Transplant as soon as the seedlings are 6 to 8 inches high; plant two or three together and about 4 inches apart, do not have the plants of each row opposite each other but in *quincux* fashion. About the 15th of October, or as soon as the grain has well filled, begin to let the water off; not all at once. Cut when ripe. Four seers and a half of seed will suffice for a beegah.

C. E. BLECHYNDEN.

Method of operating upon Stone-fruit trees, whereby it is said that the stone becomes much reduced in size, and in some cases totally obliterated. Communicated by the Rev. T. A. C. FERMINGER.

The following mode of treating the Lichee was communicated to me by Mr. R. Solano of Shahabad, about a year ago. He told me the result of it was that the stone of the fruit became much lessened; and the pulp, consequently much more abundant, considerably improved in flavour.

At any time during the cold season select a branch, that is to be used afterwards for inarching. Split it up carefully somewhat less than a span long. From both halves of the branch thus split scoop out cleanly all the pith: then bring the split leaves together again; and keep them bandaged till they have become thoroughly united. At the usual time, the beginning of the Rains, inarch the branch, thus treated, upon a suitable stock; taking for the place of union the portion of the branch just below where the split was made. Upon a branch of the tree thus produced a similar operation is performed, and so on in succession: the result being that the stone of the fruit becomes less and less after each successive operation.

Being unable, as indeed I still am, to conceive on what principle a proceeding like this could have any such effect as was stated, I must say I felt at first rather incredulous on the subject. Mr. Solano however assured me that from having practised it in his own garden he could bear full testimony to its efficacy. He also imformed me that the process had been applied likewise to the Grape-vine at Malaga in Spain; and that plants thereby had at last been produced, which bore the finest fruit, without the slightest vestige of a stone within them.

Subsequently to this and some little time after my arrival at Gowhatti, the late Genl. F. Jenkins, with his usual liberality, kindly put at my disposal a large manuscript book of notes he had made upon gardening. On reading it through, I met with the following, of which I made an extract:—

"To prevent the formation of seed in Guavas: take a "young tree, split it in the middle with a carving-knife "about 12 or 15 inches up and down: pick out the pith: "close it: cover it with earth, and bind it up with straw. "The tree will grow as before, but the fruit will have no "seeds in them."

The General told me he had never tried the process himself and could not therefore testify as to its merits; nor could he remember where he had learnt it.

It is not unlikely there are those into whose hands these pages fall, who may be able to give from their own experience some practical information upon this most interesting point. If so, I have only to add I shall consider myself under the very greatest obligation to them for any communication on the subject they may address to me direct; or if it please them better, to the Journal for insertion.

GOWHATTI:
Nov: 16th, 1866.

Particulars regarding the yield of Tea from plants of different ages in certain districts in India.

The following is the result of a circular which was widely distributed in April 1866 to the representatives of various Tea Companies in Eastern Bengal and the Hill districts. It is to be regretted that the enquiry has been so very partially responded to, for if each person to whom circulars were delivered had taken up the subject, much valuable information might have been obtained from every quarter in India where the Tea-plant is under cultivation. As it is not probable,—so many months having elapsed,—that any more replies will be received, it is considered desirable to publish the following without further delay.

Copy of a Resolution passed at a Monthly General Meeting held in March 1866:—

"That the Society endeavour to procure information as to the average yield of Tea per acre in the principal Tea Districts, specifying the yield from plants of different ages, from three year to six year old plants, the result of the actual experience of planting in the different districts."

ASSAM.

Dufla Ting, U. Assam, August 7th, 1866.—The information called for by the Secretary of the Agri. & Horticultural Society, and alluded to in your letter of 20th ultimo, with reference to the average yield of Tea per acre in Assam, opens up a question which will be found to be of the very greatest importance to those interested in the success of Tea manufacturing and planting; and although perhaps not directly *apropos* to the enquiry, yet as the answer must necessarily involve the question of success or non success of the undertaking, I purpose extending my remarks on the subject instead of strictly confining myself to a statement of the nature required by the Society.

The ordeal through which all who are interested in Tea planting have lately passed, and indeed are yet passing, suggests a very careful consideration of the subject of enquiry. There have been many causes assigned for the failure of this or that Company or Plantation, in some cases it has been attributed, and justly, to the high prices paid, the absence of qualified management, or to the unsuitableness of the locality selected; but in very few cases has the failure been ascribed to other and most important causes, the absence of proper cultivation and a partially filled area. Owing to whatever cause, it has in too many instances been found after the purchase I will say, of a property, that the existing cultivation has not only been indifferently filled with plant, but that the cultivation it has received has in all probability been of such a character as to greatly retard its growth. Notwithstanding this, and the impossibility of at once organising a thoroughly sound system of operation commensurate with every requirement prospectively and retrospectively of the place, extensions have in many instances been determined upon, without any regard to the full development of the existing cultivation. As a consequence the yield from the badly cultivated and partially filled area affords the first ground for dissatisfaction, which is not dispelled as time progresses, and it is found that the extensions from the same cause yield equally as unsatisfactorily.

If this has not been the case in all instances, it has been so in many, and in the absence generally of proper cultivation and unsatisfactory returns in consequence, afford ample grounds for a thorough change of system.

So far as I am personally concerned I cannot say that I have yet seen a Tea garden in Assam, that has received the requisite amount of culture to ensure a full return. It is therefore a matter of uncertainty at the best, what the Tea plant, cultivated on a strictly Horticultural principle, would give per acre; but from instances that have come directly under my noce, I can safely state that it is not impossible to produce generally on good soil and from a good class of Hybrid plant 1,000 ℔s per acre. That this is practicable I am in a position to prove from actual data in my possession. It must not be supposed that such a result is an exceptional case, or from a closely planted area. It is a result which is being now fairly obtained from a certain garden in this vicinity and from a given space, planted I think, 6+5. It is fair to state however, that the land has been well manured, soil and plant being of good quality, and that the cultivation of this particular piece has been of fair kind.

Hence arises then this question, whether with the means just referred to, it would not be found more advantageous to all concerned in Tea planting to confine operations to a manageable area, and to conduct such on the principle I have indicated.

Every thing is in favor of such a principle, the reduction of expenditure consequent on the increased produce per acre in proportion to the extent it would be necessary to put under cultivation, the increased richness of the leaf resulting in a better class of Tea, and the success which would most certainly attend the filling in of all vacancies,—a most important point in estimating the yield from a garden.

These are a few of the benefits to be derived from cultivating Tea gardens on Horticultural principles, to which may be added also an increased facility to the Manager and Assistants of thoroughly attending to all the requirements of the Tea plant, in all its various branches, the proper pruning of every bush being not the least important point in the future welfare of the concern. Thorough cultivation will do much, but if to this be added the application of manure, without which a regular continuance of a crop for years can scarcely be expected, I am convinced the results will be such as regards increased produce per acre, and the quality of such, as have never yet been realised.

With ordinary cultivation it is estimated as follows:—That plants of 3 years old will give 100 lbs per acre.

4	do.	,,	240	,,	do.
5	do.	,,	320	,,	do.
6	do.	,,	400	,,	do.
7	do.	,,	450	,,	do.

but as I remarked before, with a different system these quantities relatively would be greatly increased. H. C. GIBSON.

Scottish Assam Tea Co., Ld. Mazengah, Jorehaut, Assam, 19th May, 1866.—If you will be pleased to give the information of mine herein submitted a place amongst the various opinions you should receive from experienced men, I shall be very glad.

The subject is in fact the very life of the interests relating to Tea Companies, and I shall now endeavor to give you the results of six years practical experience as an Assistant on, and Manager of, the largest gardens of Assam and Cachar.

Before estimating, the Manager should go carefully over the gardens and note:—

1st The general appearance of the plant.

2nd State of the cultivation.

3rd During the season, have any plants fallen by blight, or white ants, or broken by fallen trees, &c, &c.

4th How they are planted 6 × 3, 5 × 5 and so forth.

5th Many acres of 6, 5, and 4 year old (plants) gardens, where vacancies have occurred, have been filled up with 1, 2, and 3 year old seedlings.

This must be carefully noticed.

6th If the land is much broken up by fissures as often is the case in Assam.

7th And the plants, are Assam Indigenous, Assam Indigenous mixed with Hybrid, or China and Hybrid and so forth.

8th The soil has to be considered.

9th How stands the pruning.

I think these are the principal points to be satisfied on before proceeding to estimate probable crops, and they are many, so you will see that it is most difficult to settle, without much variance, any stated out-turn for any stated district.

But I mean to say that if ordinary care is taken and the gardens well opened out at first in the matter of soil, cultivation and cutting down or leaving of shade, the average yield of Assam, and Cachar, should stand as follows:

	6 year old	5 year old	4 year old	3 year old
Assam,	520lbs	440lbs	360lbs	280lbs.
	or	or	or	or
	6½mds.	5½mds.	4½mds.	3½mds.

The above out-turn may be safely relied upon from good gardens planted either with Assam Indigenous, or that plant and Hybrid, which latter yields well and generously, always provided that the flushes of leaf are carefully watched and plucked in due course.

CACHAR.

	6 year old.	5 year old.	4 year old.	3 year old.
Cachar,	400lbs or 5mds.	400lbs or 5mds.	320lbs or 4mds.	240lbs or 3mds.

The teelah lands of Cachar do not yield like the flat land of Assam, and I have considered this in the above estimate, but when flat lands can be had in Cachar, I do not see why the yield should not keep pace with Assam.

Sometimes you may hear of a garden, supposed (for measurements of Tea Gardens can be erroneous) to have a certain area under full bearing, giving a very poor out-turn, and again a supposed similar area yielding seven or eight maunds per acre. I would like to inspect the different areas and I might be able to add hereto for my own guidance and the information of those concerned. J. H. DONALD.

ASSAM.

The Dehing Co. Ld. Dibrooghur 12*th May* 1866. I have received your letter of the 26th April enclosing a circular from the Agricultural and Horticultural Society asking for information as to the yield of Tea per acre from plants varying from 3 to 6 years old. I should think that it would be fair to assume that the average yield of good plants on good land would be at three years of age one maund of Tea per acre, and that there would be an increase of one maund every year till the plants were six years old when they would yield four maunds per acre. At six years, plants are in full bearing, if they have up to that time been well cultivated and not over plucked, and I do not think that after this period their average yield for a number of years would be over four maunds per acre, under the present rough system of cultivation. This is speaking generally of a number of plantations: some gardens do yield five maunds per acre. The heaviest crop I have ever known produced was a little over seven maunds per acre, yielded by a small plantation of only 19 acres in extent. This however was an exceptional yield after a heavy pruning. I do not think that the average produce of this garden would have been much over five maunds per acre. I should think if plants were manured, the yield of Tea per acre might be very much increased, especially after the 5th or 6th year when the natural leaf mould deposit found in forest lands has become dissipated. It is almost impossible to believe that land can be continually yielding the same crop without being exhausted, but Tea is never manured and many experienced planters contend that measure would not be beneficial. It is said, and with some show of reason, that Tea land does not require manure any more than the neighbouring Rice land. It is certainly true that there are Rice lands that have been planted with the same crop for numbers of years without being allowed to be fallow, and which are never manured, nor enriched by fluvial deposits, and which still continue year after year to produce the most flourishing crops.

H. L. JENKINS.
General Manager.

Khowang 16*th May* 1866.—Partly through being absent from home and partly from sickness I have not been able to reply to your favour of 16th ultimo in which you enclosed a letter from the Agricultural and Horticultural Society asking for information as to the quantity of Tea produced on an average per acre on plants varying from 3 to 6 years old. So far as my experience goes I think the following can be taken as a very fair average

viz say	3 years old	plants	yield	1 maund	per acre.
	4 years old	,,	,,	2 maunds	
	5 years old	,,	,,	3 maunds	
	6 years old	,,	,,	4 maunds	

In giving this I do not for a moment mean to say that Tea will not give a higher average, on the contrary I think that with very high cultivation it can be brought to yield an average of six maunds per acre. I have seen certain small pieces of land that produced seven or even eight maunds to the acre, but these cases have been quite exceptions. I look upon 4 mds. an acre as quite a sufficient amount to lay down as an average crop on factories that have reached 6 years old, —in short I am very doubtful whether there is a single factory in Assam giving a higher average at this present time.

WILLIAM WILLS, *Superintendent.*

Calcutta 3 *July* 1866.—Referring to your Circular of 16th April we beg to annex the following information received from Mr. W. H. Smith Junior the Manager of the Debrooghur Tea Company's gardens. W. H. SMITH BARRY & Co.

The Yield of Tea on.

plants	3	Years old	1	Maunds per Acre,	or	80	lbs.
	4	do.	2½	do.	or	200	,,
	5	do.	3	do.	or	240	,,
	6	do.	3	do.	or	240	,,

The above bears reference to the China variety on a medium soil.

Assam or Hybrid plants yield.—

plants of	3	Years old	1½	Maunds per acre,	or	120	lbs.
	4	do.	2	do.	or	160	,,
	5	do.	4	do.	or	320	,,
	6	do.	6 to 8	do.		480 to 640	,,

SYLHET.

Sylhet, May 16*th* 1866.—As no records were kept by my predecessor to enable me to arrive at a correct statement regarding the separate outturn of Tea, from the different aged plants, I have done my utmost by making calculations from the yearly out-turn mentioned in the annual reports, to give you a true statement. The results are as follows :—

Actual average yield per acre of		three years old plants	10	Srs.
Ditto,	Ditto,	Four year old plants	25	,,
,,	,,	Five year old plants	40	,,
,,	,,	Six year old plants	65	,,

SIDNEY TURNBULL.

Manager Sylhet Tea Compy.

CACHAR.

Rosekandy, May 5th 1866.—I have much pleasure in furnishing the information requested in your letter of 16th April. As no separate account was kept of the tea plucked from the plants of different ages and a certain extent my statement must be received with care. Off 260 acres of 6 year plant and 30 acres of 3 year plant I made 1,007 maunds of Tea. The yield I should say was as follows; off each acre of 6 year plant 291 ℔s; off each acre of 3 year plant 160 ℔s.

H. H. BROWNLOW.

Manager of Indian Tea *Co. of Cachar, Limited.*

The Sylhet & Cachar Tea Company Limited. Teelanaghur, Sylhet, 5th June, 1866.—I beg to acknowledge receipt, through Messrs. Gordon Stuart and Co., of a circular from your Society requiring information on the yield of Tea per acre in these districts, and in compliance with this request I beg to hand you (on the other side) a Memo: the result of my three years experience.

R. C. BELL,

Genl. Manager S. and C. T. Co. Lt.

Average yield of Tea per acre in the Sylhet District.

3 years old	plant	per acre	℔s.	40
4 do.	do.	do.	,,	60
5 do.	do.	do.	,,	100
6 do.	do.	do.	,,	200

Average yield in the Province of Cachar.

3 years old	plant	per acre	℔s.	80
4 do.	do.	do.	,,	160
5 do.	do.	do.	,,	200
6 do.	do.	do.	,,	240

Central Cachar Tea Company, "Limited" (Late the Gardens of the Assam Company.) Calcutta, the 2nd June 1866.—We have the pleasure to hand you copy of a letter from the Manager of the above Company's gardens, wherein he gives his experience as to the information asked for in your circular letter of the 16th April last.

WILLIAM MORAN AND CO., *Secretaries.*

Burnie Braes 22nd. May.—I herewith enclose a list of the probable average amount of Tea per acre, produced in the districts of Assam, Cachar and Sylhet from 3 to 6 years. I should say this was nearly the exact average, but of course I only judge by the gardens that I have seen. If this will not do, please let me know how the information can be gathered.

E. S. PULLAN.

Assam.		*Cachar.*		*Sylhet.*	
3 years.	1½ Maunds	3 years.	1½ Maunds.	3 years.	1 Maund
4 do.	3 ,,	4 do.	2 ,,	4 do.	1½ ,,
5 do.	4 ,,	5 do.	3 ,,	5 do.	2 ,,
6 do.	5 ,,	6 do.	4 ,,	6 do.	3½ ,,

Kanchunpore Tea Company Limited, Pakeechurah, 11th December 1866.—In reply to the request of the Agri-Horticultural Society regarding the information of the average yield of tea per acre I have had off my five years old plants 4 Maunds
four ,, 2¼ ,,
three ,, 1 ,,
this is of course the average of the entire area. I have portions of four years old plants that yielded as much very nearly as the five years old plants, whereas other portions made a very insignificant yield; the same with the plants of other ages.

This was the result with very fair cultivation, but with light pruning last year. This year with higher cultivation and much pruning I anticipate a larger yield per acre.

L. B. ROBERTS.
Manager Kunchunpore T. Co. Ld.

DARJEELING.

The following experiments were made at Dooteriah in 1866, to ascertain correctly the quantity of leaf which tea-plants of the ages and at the elevation specified may fairly be expected to yield. The plants experimented upon were simply railed off from the surrounding cultivation and the leaf from them separately gathered and recorded. Over plucking has been carefully avoided in every instance and in no case have the plants received extra care or exceptional treatment of any kind whatever.

No. of Plant.	Elevation above the sea level, Feet.	No. of Tea plants contained in it.	Year in which the seed they were produced from was sown.	Yield of leaf in 1866.			REMARKS
				Mds.	S.	Ch.	
1	5,000	1,509 1,408	1860 1863	4	34	12	The soil of this plot is I think scarcely so good as the average kind of soil upon the plantation, and the orginal plants were removed in their first year from a portion of the plantation 1.000 feet higher up. The original planting was 5×5 but it is now 5×2½ the younger plants having been filled in from a nursery in January 1864.
2	4,150	6,412	1861	12	18	6	The soil in this piece is about of an average description. The plants stand 6 feet × 4 and were transplanted from a nursery in February 1862.
3	3,775	355	1861	0	26	4	These plants are from the same nursery as those in No. 2 plot and were planted about the same time and at the same distance apart. There are very few good plants amongst them but it is not the fault of the soil which is rather above than below the average quality.
4	4,250	1,526	1862	3	9	14	The seed in this case was sown at stake 5 feet × 4. The soil is of medium quality.

5	3,850	6,343	1862	15	17	2	Part of the same sowing as the last, soil very good.
6	3,820	198	1863	0	6	4	Seed also sown out at stake 4 feet × 4, medium soil.
7	3,650	3,170	1863	5	36	4	Part of the same sowing as No. 6, but lower down and very fine plants.
8	3,800	804	{ unknown, but previous to 1859	6	21	3	These old plants are the best leaf-givers upon the Estate. They were moderately pruned both in 1864 and 1865. The soil is good, being a portion of the same slope as No. 3 and No. 5. They are very irregular, but the original planting seems to have been 5 × 5. The quantity of leaf got from them last year was 4 Mds. and 28 Seers.

B. W. Hallifax.
Manager.
Dooteriah Tea Co. Ld.

Extract from a letter received from a Gentleman who has been Manager of a Tea garden the past eight years.

I have been reading the extract from Mr. Gibson's letter in the Agricultural and Horticultural Society's Report, and believe all he says. A garden properly cultivated 5 × 4, which would give 2,176 plants per acre, when five years old, giving ten flushes during the season, ought and would yield 800 ℔s per acre. As one pound of Tea is made from four pounds of green leaf, 3,200 ℔s of green leaf would be required to make the 800 ℔s, or about 1½ ℔s from each plant, which would be as near as possible 2½ ounces each plucking, premising that ten flushes were obtained; which is nothing extraordinary.

I have always considered that a great mistake was made in opening up large areas without having sufficient labor to cultivate highly, and hope that Mr. Gibson's opinions will be adopted by you.

Notice regarding Insects injurious to Timber trees. Communicated by Dr. H. CLEGHORN.

The following notice regarding Insects which are injurious to Timber-trees, was lately circulated to Officers of the Forest Department, and is published for general information.

" Many insects are most injurious to Forest trees, and little has been recorded concerning them. In Europe, it is known that our most useful trees have their particular enemies.—

Ash is assailed by	*Hylesimus fraxini.*
Elm,	*Scolytus destructor.*
Larch,	*Laricis micrographis.*
Willow,	*Trochilium crabroniformis,* (the lunar Hornet sphynx.)

In like manner, incalculable mischief is caused in India by the destructive agency of white-ants and other insects. One insect *(Bostrichus)* reduces the bamboo to an impalpable powder; another infests the seeds of tamarinds *(Calandra tamarindi)* which crumble to dust; and a third is the coffee bug *(Coccus Coffeæ,)* which has been so destructive to coffee estates in Ceylon and Coorg. It is highly desirable that Forest Officers should note the noxious insects which infest particular trees and describe the mischief done. A fuller knowledge may lead to preventive measures.

In some parts, the carpenter bee *(Xylocopa)* bores through posts, rails and beams, occasioning serious injury to houses; in many districts the bungalow servants are instructed to destroy these mischievous insects as they emerge from their tunnels.

In visiting wood depôts, the Forest Officer cannot fail to observe the damage caused by timber-eating beetles, and it is important to trace out the history of these destroying agents and to apply a remedy.

Any observations upon the natural history, economy and proceedings of such insects as are injurious to trees (living or dead,) and any detail of experiments made for the destruction of the insects, or for preservation from their attacks, might be of much practical utility. Figures of the insects in their different states, and specimens of the wood showing the effects produced, would enhance the value of such communications.

These communications would be referred to the Natural History Committee of the Asiatic Society, and eventually to the Entomological Society, London."*

Note on the Plantains of the Indian Archipelago. By Mr. SULPIZ KURZ, *Curator of the Herbarium of the Royal Botanical Gardens, Calcutta.*

The group of Plantains may undoubtedly be called one of the finest ornaments of the tropical zone, and form in company with palms, screwpines and bamboo, the principal feature of the East Indies. A tropical landscape without these constituents can be seen only in such regions, which owing to a great elevation, have become already too inhospitable for their growth. America alone appears to have been destitute of Plantains at some remote period, but it possesses a great number of the *Heliconias*, a subfamily not less ornamental.

The continent of India is usually designated as the native country of the cultivated kinds of plantains; a view I can entertain only partially. After long inquiries into this question on the Malayan islands I have come to the conclusion that the cultivated Plantains belong to several botanically different species, (as will be shewn below) and also, that the original species, from which most of the numerous varieties now in cultivation in the Archipelago descend, is a Malayan species, not yet found further to the North than Malacca.

This kind (*Musa simiarum*) is known to the Javanese under the name of "kuhlch"* and is found in great quantity not only in the hilly parts, where it forms with several large *Elettarias* a marked zone of vegetation (that of the *Scitamineæ*) but also in the lower moister parts throughout the Malayan Archipelago, the Moluccas and Malacca. The only species of *Musa*, which occurs on the Andaman islands might prove perhaps to belong to this.

Musa sapientum,—a second kind of plantains remarkable for its numerous varieties, is a true continental species, occuring in the forests from Behar up to the Himalaya. It was also found wild by Mr. Teysman in some jungles of Java but might have been carried there by the agency of birds, which are very fond of the fruit.

Musa textilis,—the third species, offering a vast number of varieties, is confined to the Philipines and Moluccas. Little is known about its different sorts of fruits except what Father Blanco has published in his *Flora de Filipinas*. It is however universally known for its strong fibre.

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* A striking resemblance to the Bengalee "Kela."

A fourth species of plantains,—which however has not yet come under my inspection,—is indigenous all over the Pacific islands and referred to *M. uranoscopos* by Dr. Seemann, but it is evidently different. *Musa rubra*, mentioned in the Narrative of the Austrian frigate Novara, appears to be the same species. This is also said to be cultivated in several varieties.

Musa nana,—the dwarf plantain, bears also edible fruit, but is rarely cultivated. It is found wild, especially in Cochin-china and also in Sumatra.

I give here a short account* of the various species of the genus *Musa*, with special consideration of the cultivated forms.

MUSA *Rumph.*†

A. Spadix drooping.

§ Spathes of the steril flowers convolute. Stoloniferous.

1 M. SIMIARUM *Rumph.* Spathes violet, only one opened at the same time and revolute; leafstalk long, nearly without membranaceous margins.

Var. α Sylvestris, (M. acuminata Coll.) in all parts more slender, stem varying in colour from green to dark purple; leaves narrow, green, spotted or purple beneath, pruinous or

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[*] This is partially an abstract from my Review of Indian *Musaceæ*, which will be soon published in Prof. Miquel's *Annales Musei Lugd.* Batavorum.

[†] The genus *Musa* has recently been split into Ensete *Bruce* and Musa *Dod.* Mr. Horaninow (Prodr. Scitam.) has suggested also, that *Musa* itself might include other distinct genera. He has evidently never had a greater matorial for examination and confined himself therefore to a sole compilation of the different species without entering into any particulars.

The variability of the flowers is great, as regards their size, the number of the lobes of the outer perianth, the form of the inner perianth (labium), which is now acuminate, now abruptly pointed, often grown together with the outer one into a perfect tube, or even all the 6 petals are quite free! Also the number of stamens varies very much, and is often encreased to 7—8 (though exceptionally), or it occurs more frequently, that the sixth abortive stamen becomes fertile. The seeds do not present any characteristic, to be assumed for a generic distinction. The fruits are treated in this paper sufficiently. As regards the "fructus coronatus" this occurs also in a more or less degree in all other *Musas*.

smooth; flowers whitish or yellowish; interior petal acuminate, nearly as long as the exterior; fruits cylindrical with a thin beak, full of seeds, yellow.

This is a wild growing kind and rarely cultivated by natives, when so it becomes soon, what they call *Peesang mahs* (golden plantain.) I have noted about 6—8 varieties, mostly differing in colour of the leaves and fruits as also by the greater or lesser amount of wax, which they exude on the undersurface of the leaves. One kind does this in such a degree, that the wax is used by the natives for candles.

Var. β. *violacea*, stem blackish purple, leaves blackish-purple spotted, purplish beneath; flowers dirty purple; fruits 5—3 angled, with a thick and obtuse beak, purple, many seeded (or in the cultivated form, seedless.)

Of this variety only one cultivated form has occurred to me with purple or red fruits of an excellent quality, called *Peesang teembaga* or *P. koorang* by the Malays (copper, or crab plantain.)

Var. γ. *culta*, very variable, mostly larger and more robust in all its parts, flowers much larger, whitish, yellowish, or on the back tinged with orange or violet, either all fertile, or only those of the lower whirls and the remainder deciduous; fruits large, cylindrical or angled, without seeds or only occasionally some of them interspersed, green or yellow.

This is the principal and most important form in the Archipelago. There are noted by me about 100 varieties and forms which I however reduced to about 48 marked sorts. Amongst these I may mention for curiosity, *Peesang mooloot bebbek* (plantain with the beak of a duck,) the fruit of which are prolongated at the apex about $\frac{2}{5}$ of its whole length, whence the name.

The most delicate and esteemed kinds are *Peesang radja* (Royal plantain); *Peesang ambon* (Ambon plantain) and *Peesang soosoo* (Milk plantain). According to my observations all the cultivated forms, belonging here, might be brought under the following two heads:

1. *Peesang mahs* (golden plantains), which have smaller cylindrical fruits of a yellow, rarely green colour. The inner petal of the flower is long, acuminated.

2. *Peesangs of a superior quality.* Fruit generally angled, larger, of a yellow, reddish or often green colour. The inner petal at the apex abruptly acuminated.

Var. δ corniculata (Musa corniculata *Lour.*) Spathes only 2, 3, rarely 4, sulcate, deciduous, the upper whorls of flowers reduced to a swelling only; flowers all fertile; fruits very large, angled.

There are about 5—6 different forms of this. The most common and curious is *Peesang tundook*, having fruits nearly 2 feet long.

Another form, which I however did not see, produces only one fruit in the stem itself which bursts afterwards, when ripe. It is very rare and must be of an enormous size. It is said, that 4 persons can satisfy themselves by a single fruit of it. It certainly appears to me to be only a monstrosity, as the whole variety *δ corniculata* is subject to monstrosity.

The fruits of all these are not eaten raw, but excellent for cooking.

2. M. BASJOO SIEB. Spathes yellow; leafstalks short: with a broad leafy margin. (Japan.)

§§. Spathes of the sterile flowers imbricate.

* Stoloniferous.

† Spathes sulcate, more or less pruinous or even whitish powdery.

3. M. NANA Lour. (M. Cavendishii Lin.) Dwarfish, spathes of the sterile flowers persistent, inside dirty violet; leafstalks very short with a broad leafy margin. (Cochinchina, Sumatra)

4. M. SAPIENTUM *L.* (incl. M. paradisiaca L.) Large, spathes of the sterile flowers concave, always several opened at the same time, deciduous, inside crimson coloured; leafstalks long with membranaceous margins.

This species is poorly represented in the Archipelago, though

10—12 kinds have been noted by me, all of which are used there only for cooking. On the Indian continent however this is the most if not solely cultivated kind, though its fruits never equal the quality and delicacy of the cultivated forms of M. *simiarum*.

All the different forms, belonging to this, can be easily divided into such which bear seeds, and into those which are seedless.

A legend exists amongst the natives of Western Java about the seed bearing form, called "*Peesang buttoo*" (stonebearing palntain), which I shall note here.

There was a Rajah, who was very fond of this kind of plantain, at that time bearing no seeds. His subjects however were not less fond of it and they ate so many, that finally none remained on the trees. The Rajah, asking one day for his favourite fruit and seeing all his trees plundered, became very angry and took a hand full of cotton seed, strewing them in all directions of his empire, with the curse that all his favourite plantain trees should bear only cotton seed. From that time no *Peesang buttoo* could be found in the whole country, which did not bear seed.

†† Spathes smooth, polished.

5. M. Textilis *Coll.* (Philipines, Moluccas.)

** Without stolones.

6. M. Ensete *Gmel.* Seeds as large as a hazelnut, smooth (Africa.)

7. M. glauca *Roxb*: Stem elongate, spathes persistent, smooth, green. (Burma and Java.)

8. M. Nepalensis *Wall.* Stem short; spathes deciduous, inside purple; leafstalks sheathing. (Nepal.)

9. M. superba *Roxb.* Stem short, conical; spathes deciduous, brownish-purple, smooth; leafstalks not sheathing. (Hindoostan.)

B. Spadix erect.

§. Spathes of the sterile flowers convolute.

10. M. ORNATA *Roxb.* Spathes lilac; flowers orange-coloured, exterior and interior petals equally long; seeds tuberculate. (Chittagong.)

§§. Spathes of the sterile flowers imbricate.

11. M. RUBRA *Wall.* Spathes red; flowers orange coloured; interior petal short; fruits and seeds smooth. (Burma.)

12 M. DASYCARPA *Kurz.* Fruits hairy. (Assam)

13 M. COCCINEA *Andr.* Spathes bright crimson; flowers orange coloured; exterior and interior petals equally long. (Cochinchina.)

14. M. SALACCENSIS *Zoll.* Spathes whitish lilac; flowers emerald green; exterior and interior petals equally long. (Java, Sumatra.)

15. M. URANOSCOPOS *Rumph.* Large; spathes green.

There remain dubious M. *Banksii* F. Muell, from Australia, and M. *Livingstonii* Kirk, from S. Africa, the former allied to M. *simiarum*, the latter apparently to M. *Ensete.*

The cultivation of Plantains offers but little difficulty, especially in a rich black soil and in a genial climate. The Javanese appear very skilled in cultivating them and in producing new forms of fruit. The vast number of varieties, already in their possession, prove this. Their principle is to change the locality, where they grow plantains, every two or three years; to remove all superfluous runners and to cut the old stems which have produced fruit into pieces, using them at the same time for manure.

If these precautions are neglected, the fruit becomes soon seed bearing and thus degenerates.

Preventive against the attacks of White Ants.

Having observed in the *Indian Daily News*, of 9th October, that enquiry was made as to the best mode of destroying white ants, I beg to call your attention to the following method which was found very efficacious in plantations of sugar cane:

Take a small quantity of arsenic and mix it up with a few ounces of burnt and pulverised ship's bread, oatmeal, flour, or ripe plantain, moistened with molasses. Place the size of a turkey's egg of this compound on a flat board covered with a wooden bowl, and put these in several parts of the plantation. The ants will soon take possession of these wooden vessels and the poison will have a general effect; for those ants that die being always eaten by the others, the whole of the estate will be effectually cleared of white ants.

David G. Morgan,—*Calcutta* 11*th October*, 1866.

I have observed in one of the Meeting Reports of the Society, a communication from Messrs. Wm. Moran & Co., requesting to be informed of a preventive against white ants; Tea plants on one of the Cachar Gardens having been attacked by them. I can state from my experience at Akyab, where white ants are very numerous and destructive that manuring the plants with lime, just before the rains set in, and at the beginning of the cold weather, will scare away the white ants from the immediate vicinity of the plants so manured. I have had no occasion to try lime as a preventive against white ants for the Tea plants, but as it succeeded with other plants, I have no doubt that Messrs. Wm. Moran & Co. will find it a good preventive on their garden. Any other information on the subject, if needed, I will be most happy to supply.

J. P. Langlois,—*Chittagong*, 8*th November* 1866.

Correspondence and Selections.

1.—AGRICULTURAL EDUCATION IN BENGAL.

(Read at monthly General Meeting of 20th February, 1865.*)*

To THE SECRETARY TO THE AGRICULTURAL AND HORTICULTURAL SOCIETY

Darjeeling, the 20th August, 1864.

SIR,- I have the honor to forward the accompanying papers* which I beg may be laid before the Council of the Agricultural and Horticultural Society, with a request that they will favour me with their opinion on the subject of Agricultural Education with reference to the capabilities and requiremnts of the Lower Provinces of Bengal.

2. The main questions to be considered at the outset appear to be these :

Is there any probability that theoretical instruction in the scientific principles of the farmer's art, will be of any advantage, under present circumstances, to the people of this country ?

Is there any existing class possessed of the requisite preliminary education, who would seriously take up agriculture as a practical science, with the view of turning their knowledge to account, either for the improvement of their own property, or in the pursuit of farming, as a profession ?

And again, supposing that there is such a class, is the theoretical instruction, which alone can be imparted in the lecture-room, the kind of training which is likely to prove of practical advantage to them ?

3. It will be remembered that it is only within recent years that Agricultural Schools have been established in England, and these are attended almost exclusively by a class of students who intended to make farming, on a large scale, the business of their lives, and who

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* Letter from Baboo Joykissen Mookerjee to the Officiating Secretary to Government of Bengal, dated 15th March, 1864.

Letter from Baboo Hurry Mohun Mookerjee to the Officiating Secretary to Government of Bengal, dated 11th May 1864

Letter from the Inspector of Schools, Central Division, to the Director of Public Instruction, No. 658, dated 8th. July 1864.

leave the class rooms to enter on an apprenticeship to some practical Agriculturalist, from whom they learn those necessary practical details, without which their theoretical knowledge, however sound, would not only be valueless, but often mischievous.

4. It appears doubtful whether any corresponding class can be found in this country, who would systematically attend an agricultural lecture-room. Indeed the land system of the country would appear to make the existence of such a class impossible ; and if this is the case, it is difficult to perceive what would be gained by engrafting on a College, connected with the University, a professional agricultural department, such as is contemplated by Baboo Joykissen Mookerjee. A few students of the general department might no doubt cursorily attend the agricultural lectures from motives of curiosity, but it may be doubted whether the knowledge they would carry away would be of much value in itself, or, would be ever applied to any useful purpose.

5. If anything is to be effected for agriculture, and the improvement of cattle through the agency of schools, more might possibly be done by introducing these subjects in a popular form into the course of instruction provided in the Normal Schools for the training of village school masters, than by the more ambitious attempt to indoctrinate College students with the theoretical principles of agriculture depending on the applications of various allied branches of the Physical and Natural Sciences. Through the Normal Schools improved ideas about agricultural arrangements, and the management of cattle, may be gradually diffused throughout the country amongst the actual cultivators of the soil, and in this way some good may be effected, but it seems doubtful whether anything more then this can be done with advantage by the direct agency of Schools or Colleges.

6. If however the Council should be of opinion that an attempt to convey systematic professional instruction in agriculture may be made at the present time with fair prospects of success, I would, in that case, beg to be favoured with a general outline of the course and nature of the instruction which they would think most suitable for the people for whom it is designed, and which could be handled with reasonable effect by such teachers as are here procurable.

7. On the other hand, if they are of opinion that little good is to be anticipated from the adoption of such a course, under the existing circumstances of the country, I shall then be glad to be informed whether there is any other mode by which, in their opinion, the Education Department can aid in promoting those improvements, which are, on all hands, acknowledged to be of vast importance, no less to the

country at large, than to those who are more directly interested in the cultivation of the soil.

I have, &c.,
W. S. ATKINSON.
Director of Public Instruction.

W. S. ATKINSON, ESQ. *M. A.*
Director of Public Instruction.

SIR,—I have now the honor to acknowledge receipt of your letter No. 2770, of the 27th August 1864, forwarding certain papers from Baboo Joykissen Mookerjee and others, regarding Agricultural Education, and requesting the opinion of the Council of the Society on the subject, with reference to the capabilities and requirements of the Lower Provinces of Bengal.

2. In reply, I am desired by the Council to intimate that, having duly and carefully considered the subject in all its bearings, they are of opinion that the time has not yet arrived for the appreciation of the importance of an agricultural education as a speciality, and that the Society could not properly recommend an outlay of public money on attempts to promote it. To all the three questions submitted in the 2nd paragraph of your letter, the Council are disposed to answer in the negative. From what they can learn, the village Schools do not appear to be largely frequented by the sons of the "chassa" or agricultural classes. One of the Members (Mr. Sawers), remarks to the following effect on this point :—

"During a long residence in the mofussil, I have had opportunities of visiting many schools and have myself been instrumental in the establishment of schools, and have always found that the class of boys, who attended those schools, were not such as required or would benefit by an Agricultural Education: and if, among the boys there might be some, the sons of the *chassa* class, they were not sent there for the purpose of education to enable them by enlightenment to improve upon the system of husbandry and tillage, which had raised their fathers to comparative opulence, but they were sent for the purpose of being fitted to enter a different sphere of life altogether."

3. Dr. Anderson also (another Member,) gives the result of the attempt made for some years in the Botanic Garden, on the establishment of a School for educating the sons of *Mallees*, in the simplest principles of horticulture. "The education imparted"—he observes, —" had a reference solely to horticulture, and it was supposed that the parents would highly prize the privilege of having their children

educated in their own calling. Instead of this, however, the small amount of English and writing necessarily taught, were looked to as the sole advantage to be obtained, and the boys, as soon as they considered themselves proficient in these acquirements, gave up gardening for, what they considered, more lucrative employment.

" At the same period an attempt was made to explain to the *Mallees* orally in the vernacular a few of the simplest laws regulating the growth and propagating of plants, naturally and artificially, as well as the effects produced on plants by the changes of the seasons. This was also a complete failure, as appeared by an examination of some of the more intelligent men. They had learned nothing; but they seemed fully impressed with the notion that they were expected to do their work in some way or other, different from what they had been accustomed to."

4. The Council would observe, that the result of the Society's attempts towards meeting the wants of its Members for a superior class of gardeners, was equally unsuccessful. After an existence of 9 years, during 6 of which about 60 boys entered their school, and the expenditure of Rs. 3,500 for wages to scholars and masters, only two lads, so far as can be traced, have followed the profession of gardening. " The failure thus recorded," observe the Garden Committee, " has not arisen from want of encouragement. Due notice was given to the lads on entering the school—and frequently reiterated,—that when sufficiently acquainted with their work, they would receive good situations in the Garden, and that as applications were made to the Society, they would obtain situations with wages, ranging from 8 to 16 Rupees a month, according to their ability. The failure may rather be attributed, the Committee think, to the desire which a little knowledge of reading and writing has imparted to them, of following occupations which are not only considered more respectable, but which probably give a more immediate profitable return in the shape of wages:—thus, a lad would rather take employment as a Sircar, at 7 and 8 Rs. a month, than a *Malee* at 6 though he might, in the course of a few years, obtain double that sum: in fact, the one is more tangible than the other, consequently more prized."

5. Nor has the move, made by the Society ten years ago, to infuse a taste for Agricultural and Horticultural improvements among the adult population of Bengal, been encouraging. In the year 1854, the Translation Committee issued the first No. of a work called the " Indian Agricultural Miscellany," and published 5 Nos. subsequently to complete a volume. The majority of these papers are translations from

the Society's Transactions and Journals; the rest are original communications prepared expressly for the Miscellany. In the introductory paper to the first Number, the Commitee earnestly invited the co-operation of the Members of the Society, and the public generally, in the undertaking. They add in the last Number an expression of their regret at being obliged to announce that very little assistance had been accorded to them, by those to whom they materially looked for aid, namely Native Zemindars and other wealthy members of the Community. Up to the present time, though sold at prime cost, not more than Rs. 152 have been realized on account of this publication, so limited has been the demand for it, notwithstanding that it has been acknowledged by communications received from several Gentlemen, possessing considerable knowledge of the country and the people, that the language employed in these pages is such as is intelligible to the meanest capacity. Of another little work, compiled by a zealous Native Member of the Society, Baboo Peary Chand Mittra, and published in 1861 under its auspices, entitled the "Krishi Patta" or Agricultural Readings, only 81 copies have been sold up to the present time

6. But while not disposed to recommend for present adoption the project advanced by Baboo Joykissen Mookerjee, the Council are quite willing to allow that the move emanates from the right quarter If other landholders will come forward and show themselves equally ready by purse as well as by exhortation, to promote an improved system of agriculture on their estates, there may be, some years hence, the Council hope, candidates for an agricultural education, and the Society would then be quite prepared to recommend to government to provide for this demand in their Schools and Colleges. The Council are of opinion that meanwhile the Education Department may be advantageously preparing itself for such a demand, by introducing the subject of Agriculture in its Normal Schools, as proposed in the fifth paragraph of your letter, under acknowledgement.

7. I am directed, in conclusion, to take this opportunity of expressing the acknowledgements of the Society for the evidence afforded by your letter of the interest which the Lieutenant Governor takes in the promotion of Agriculture; and of the good results likely to be rendered to the objects of the Society from the system,—so happily inaugurated by his Honor,—of annual Agricultural Exhibitions and competitions through the different divisions of the country.

I have, &c,

CALCUTTA. (Sd.) A. H. BLECHYNDEN,
16th Feb. 1865. *Secretary.*

2.—MEMORANDUM ON THE MANUFACTURE OF TAR. BY DR. H. CLEGHORN, CONSERVATOR OF FORESTS.

It seems desirable, as a matter of economy, to turn our attention to the preparation of Tar, an article much required in Public Works, and of which there is a very large consumption.

Native Process.—The natives of the outer Himalaya prepare tar in a simple way from fragments of Chil, (*Pinus longifolia).* The dry chips are put into a large earthen pot, with a narrow neck, containing about 10 seers, and in the bottom four or five small holes ($\frac{1}{5}$th inch) are drilled. The pot so filled, is luted over with stiff wet mud on the top and sides. A hole being dug in the ground, a smaller pot holding ¾ seer is placed in it, and the larger one on the top; the joint being luted, and the surrounding space filled up with earth, a heap of cow-dung bratties (15 seers) is piled over the whole, and as much more as is required to keep up the fire for 8 or 9 hours.

The residue of each pot gives 5 chitaks of Tar and one seer of charcoal; four men will easily make 2¼ Maunds, or nine large pots full of Tar in the month, and the cost will be—

			Rs.
Four men at Rs. 5,	.. ..	„	20
Purchase of pots,	.. ..	„	1
		Total,	21

on 2¼ maunds = 3 annas 8 pie per seer. The value of the charcoal near the rail or a large town will reduce the cost of Tar to 3 annas per seer, or probably less. The product appears to be equal to the Tar imported from Europe which is prepared on a larger scale.

Mr. Smithe's Method.—Mr. J. D. Smithe, Civil Engineer, adopted a modification of this plan at the Madhopore Workshops. On the large pot, holding twelve seers and filled with chips he placed a smaller one inverted, luting the joint and upper surface with stiff mud, 5 inches thick; these vessels thus prepared, are put on the top of a third which we may call the receiver, and as in the former method, the joint being luted, the whole is covered with fuel and a fire lighted.—

Four to eight hours are necessary to extract all the Tar. After the fire has been extinguished and the vessels have cooled, the ashes should be raked out, until the under vessel or receiver is visible; the large pot should then be carefully lifted off, with a thick cloth in the hands. As the layer of mud is essential for the preservation of the vessels, time and fuel will be saved, if by careful management, the coating is not broken ; each time it is renewed, a considerable expenditure of fuel takes place. Care is necessary in lifting the large pot to prevent lute or ashes falling into the receiver which contains the Tar. The charcoal should then be taken out of the large vessel and the Tar out of the receiver, when they are ready to be charged again, as at first. Common bazar pots may be used, and with good management, they may be fired 10 or 12 times : the economical working of the Tar Factory very much depends upon care and attention. The posts may be worked in a row 1½ foot apart—by this arrangement there will be a great saving of fuel. The average produce according to Mr. Smithe is as follows.

"One seer of wood yields 2-6 chitaks of Tar, and 4-3 chitaks of charcoal, giving 6-9 chitaks as the produce of each seer of wood put into the pot, or 43·1 per cent. To procure a seer of Tar 6 seers and 4 chitaks of fresh chips are required for charging a pot, and 2 maunds 6 seers and 9 chitaks of chips for fuel." *Selections from the Public correspondence of the Punjab Administration Vol. ii. p.* 251. The estimated cost is about one anna per seer, which however seems to be too low.

The preparation of Tar will be found useful for clearing the timber yard of chips which accumulate rapidly and are usually unsaleable. The pots should be charged with chips about, 1 or 2 inches thick and 3 to 5 inches long.

Uses of Tar.—The tar produced by the above process, from the chips of Deodar,* Chil,† or Kail,‡ is of a superior description equal to Swedish tar. It is a mixture of resin, and oil of turpentine, more or less blackened by the admixture of empyreumatic products : it thickens after exposure to the atmosphere, and may be used for coating boats ; it is valuable as a preservative for all the wood work of dams, regulating bridges and Railway sleepers, also for telegraph posts and wooden fencing.

* Cedrus Deodara.
† Pinus longifolia,
‡ —— excelsa,

It is supposed that the European overseer or native subordinate in charge of timber depots might with advantage superintend this manufacture, which in many cases would contribute an appreciable item to the Forest Revenue of the Division.

29th December, 1864.

3.—ON THE REVERSION AND RESTORATION OF THE SILKWORM. BY CAPTAIN THOMAS HUTTON, F. G. S., OF MUSSOOREE, N. W. INDIA. (COMMUNICATED BY MR. FREDERIC MOORE.)

[*Read 2nd May*, 1864.]

Introductory Remarks.

For many years past the utmost anxiety has prevailed on the European Continent, and more especially in France, in regard to the condition of the common silkworm, known to science as the *Bombyx Mori*, the constitution of the worm appearing to be so thoroughly weakened and undermined, by diseases arising from a long and uniform course of domestication, bad nourishment and other prejudicial influences, as to excite the most lively apprehensions lest the insect should suddenly become extinct.

That such apprehensions are far from groundless may be seen in the fact that one form of disease by which the worm is attacked, known in France as "*la muscardine*," is said by M. Guérin-Ménéville annually to destroy more than *one-fourth* of the worms; and it has been clearly shown by this eminent Entomologist, and by several experienced cultivators of silk, that the crop has, within the last ten years, dwindled down to about one-half of what it used to be.

Various remedies have, of course, from time to time been tried for the purpose of arresting the progress of disease, sometimes with partial and temporary effect, but more generally without any success at all.

In consequence of these maladies, and their inability to arrest them, the French, with prudent and praiseworthy foresight, are using every possible means to introduce and acclimatize other species, which may, in some measure, fill the commercial void which would be created by the loss of the common silkworm.

Under these circumstances it occurred to me, that while assisting our continental neighbours in the introduction of such wild species as occur within our Western-Himalayan forests, I might as well at the same time endeavour if possible to reclaim and restore to health the most valuable species of the whole; and, consequently, for several years past I have studied and experimented upon the *Bombyx Mori* and its domesticated congeners, with a degree of success which I now purpose to unfold.

In experimenting upon the worm I have not confined my efforts within the narrow limits of an endeavour to cure particular phases of disease, but to effect a permanent benefit in the restoration of a healthy and vigorous constitution, which, if accomplished, as I think it may be, will of itself not only cast out this or that particular phase of disease, but all the diseases under which the worm is now labouring; and I am fully convinced that until such radical change has been wrought, it will be but time and labour thrown away to seek to cure particular maladies as they appear.

Hitherto the results of my experiments have been such as to warrant my entertaining the most sanguine hopes of ultimate success, provided the same system be carried on for a few years longer, when it will of course depend upon the cultivator to maintain the advantages thus secured.

Of all the groups comprised within the family of the *Bombycidæ* that in which the genus *Bombyx* is contained, is, perhaps, in a commercial point of view, the most interesting and the most valuable. This genus contains, besides a few wild indigenous species widely scattered over the continent of India, all those long domesticated species popularly known as "*silkworms*," which were centuries ago imported into Europe from the northern provinces of China, where for many centuries previously they had likewise been kept in a state of domestication.

Having, however, already, in a paper entitled "Notes on the Silkworms of India," entered somewhat fully into the history of the Chinese species, I need not here travel over the same ground, but shall call attention to facts not previously noticed, and endeavour, after exposing the folly of insisting, as some still obstinately do, upon the healthy and vigorous constitution of the insects, to show by how very simple a method the worms may be induced to *revert* from their present artificial and moribund condition to one of vigour and permanent health.

Discovery of the Silkworm.

According to the commonly received chronology the discovery of the silkworm in China was made about the year B. C. 2640; and the means of reeling off, or unwinding the fibre from the cocoon, being also discovered, the regular domestication of the insect at once commenced.

Whether the species then discovered was, in reality, that to which naturalists have since assigned the name of *Bombyx Mori*, or whether the discovery of more than one species then occurred, we have now no means of positively ascertaining, nor indeed, does it much signify, as for the present, at least, it *is* with that known and cultivated in Europe as an annual that we have to deal; but from a paragraph quoted by Mr.

F. Moore from the "Account of the Ceremonies of the China Dynasty," it would appear as if more than one species was under cultivation at the time when the "Account" was written, inasmuch as it contains an allusion to a second crop of silk, when it says—"the officer who adjusted the price of horses forbad the people to rear a second breed of silkworms in one season." Now whatever the *Bombyx Mori* may be when cultivated in Cashmere, Persia or Europe, it may undoubtedly be made, in a suitable temperature, to produce an autumnal brood; this, however, refers to the worm after having been submitted to my experiments for two or three years, and when, indeed, it may be said to be fast travelling back to a state of nature. The same thing occurs likewise with regard to another species which is also an annual, as far as I can learn, in all countries, except Mussooree. in the western Himalaya; this is the *Boro Pooloo* of Bengal and *Bombyx textor* (nobis), which like the *Bombyx Mori*, yields an autumnal crop when treated in a particular temperature. This fact, indeed, has led some people to declare that the two are but varieties of the same species, and that in a state of domestication all may, by the application of certain temperatures, be made to yield several crops of silk annually. This, however, may fairly be denounced as pure nonsense, the occurrence of the two crops arising solely out of the fact of our having in autumn a recurrence of the spring temperature or what may be called a double season. Hence, since a particular degree of temperature causes the egg to hatch, whenever the season returns in which that temperature is produced, the young worm is of course excluded from the egg. It is quite possible then, and even probable, that these species may originally have done the same in their native country, and the reason why they have ceased to be double-brooded in Europe and other localities is to be attributed solely to the uncongenial temperature, which is sometimes too high, at other times too low; and with respect to those species which are termed "monthly" worms, if it were really the case that the number of crops is due to cultivation in warm climates, it ought to follow that, when domesticated in a cold climate, the frequent succession of silk crops should become less frequent, and the worm give symptoms of reverting to its old habits. Such, however, I have not found to be the case; for although I have succeeded in obtaining two broods from *Bombyx Mori* of Cashmere and *B. textor* of China, yet the small monthly China worm (*B. Sinesis*, nob) has continued yielding crop after crop even to the middle of December when the eggs were again deposited in a temperature of 53° of Fahrenheit. Hence I adhere with good reason to the opinion that all are naturally distinct species. Consequently, as all the other accounts, quoted by Mr. Moore and other authorities, lead to the conclusion that one spring crop only was produced by the worm originally cultivated in China, it will be well to allow the annual species domesticated in Europe as *B. Mori* to retain that distinctive title, more especially when we consider that as the people were forbidden to rear—not merely *a second crop of silk*, but—"*a second breed of worms*," the stock, if double-brooded, would speedily have been destroyed and lost by such interdiction. This, then, would tend to prove that the worm under cultivation was an annual only, and that prohibition extended to other species.

Introduction into Europe.

From the year before Christ 2,640 until 550, or thereabouts, of the Christian era, the domestication of the worm appears to have been exclusively confined to China, severe punishments being inflicted upon any one who ventured to attempt its exportation into other countries, when, at length, about the latter year, through the laudable zeal of missionary monks who had visited China and there learnt the mode of cultivation, the eggs were secretly conveyed into Europe and presented to the Emperor Justinian.

Constitution impaired by Domestication.

Thus, for a period of more than 3,000 years, the so-called cultivation of the worm had remained exclusively in Chinese hands. What wonder, then, if the constitution of the insect had during that time been gradually undermined by a course of imperfect feeding, close and tainted atmosphere and various other enervating causes, until, at length, when imported into the West, it no longer retained its natural vigour, health and original characteristics, but had become enfeebled, degenerated and sluggish, by a long system of interbreeding with debilitated stock, and rendered liable, by the loss of constitution, to a multitude of diseases !

From the time of its introduction into Europe, the treatment it has experienced has been, with some modifications, nearly the same as that pursued in China ; so that for an uninterrupted period of no less than 4,500 years, the worm has had to contend against all those unnatural and purely artificial influences arising from a state of domestication, which we erroneously persist in terming *cultivation*, without one single renewal or infusion of the original healthy and natural stock from which the race has descended ! Truly has it, as Darwin would say, undergone "the struggle for existence !"

One would almost be tempted to think, that the object of cultivators had actually been the destruction of the insect, for in what other department would breeders so long have neglected to infuse new blood into their domestic stock? Is it not a well understood and long-established fact, that, whether among animals or plants, an occasional renewal of seed and re-infusion of the original stamina is found to be absolutely necessary for the preservation of health, and of that particular standard of perfection which it is thought desirable to maintain? And yet with the domesticated *Bombyx Mori* this necessary precaution has been uniformly neglected for 4,500 years! What wonder, then, that under the combined effects of bad and scanty food, want of sufficient light and ventilation, too high a temperature, and with the constant and unvarying interbreeding of a debilitated stock, the insect should have become subject to a multitude of maladies, and threaten, at no distant period, to become extinct!

By here condemning the system of interbreeding, I must, however, guard against the possibility of being misunderstood, for I am well aware that in France a very senseless outcry has been raised in some quarters against the interbreeding of brother and sister, and other near relatives, as if, in a state of natural freedom, such a proceeding was not the general and authorized rule. What I condemn, and in this I am happy to find myself supported by such weighty authority as that of M Guérin-Méneville, is not the intercourse of near relations, but the incessant interbreeding of diseased and debilitated individuals, which, as "like produces like," cannot possibly do otherwise than perpetuate and aggravate both disease and debility. Where brothers, sisters and cousins are all healthy and of sound constitution, no bad consequences will ensue from their interbreeding, for such is the established plan upon which nature acts; but where disease exists, the breeding from two deteriorated individuals, whether they be nearly or distantly related, will only add fuel to the fire, and perpetuate, and even aggravate, disease.

I assert, then, that there is no such thing now in existence as a perfectly healthy domesticated stock of silkworms, the colour proving, beyond all doubt, that the constitution has been utterly destroyed, and the wonder rather is, that the worms have continued to live so long, and to yield such good returns under such a constant struggle against adverse circumstances; for it seems quite evident, since naturalists have never recorded the colours of the caterpillar to be otherwise than ashy or creamy-white, that even so long ago as the time of the Emperor Justinan the true colour of the worm had already been obliterated by the centuries of mismanagement to which the Chinese had subjected the insect. It is true that the occasional occurrence of darkcoloured worms among the general brood has been observed, yet these occurrences are always spoken of as exceptional cases indicating variety arising from domestication, rather than as denoting, what in reality is the fact, an attempted return, on the part of nature, to the original colours and characteristics of the species.

Under no other supposition than this does it appear possible to account for the error committed by the older naturalists; and, consequently, I again assert, with the greatest confidence, and shall presently prove, that the whiteness of the worm is to be regarded solely as a positive indication of the loss of constitution, and that the species, in its natural colours, has yet to be described.

The Fruitlessness of seeking for healthy Seed.

I shall probably be told that learned and experienced men have occasionally been sent from Italy and France, in order to collect fresh seed (as it is termed) for the purpose of renovating the sickly stock of Europe by the re-infusion of a healthier and more vigorous constitution from the worms of India and of China. Such an assertion, to a certain extent, would no doubt, be true, since it cannot be denied, that a search for healthier stock has often been made, though never with success, from the simple fact, that whether in Europe, Persia, India or China, the worms are all equally degenerated, or if indeed there be a difference yet perceptible, it is altogether in favour of the European race. We can all "call spirits from the vasty deep—but, will they come when we do call?" Had a search been instituted in China for *the wild worm* in its original state of freedom, great benefit would no doubt have ensued from its discovery; but if we reflect that the worm, even in its native country, has, like that of Europe, been immemorially of a pale colour, a Chinese cultivator on being asked for the original wild stock would at once acknowledge that he knew the worm under no other aspect, and in no other condition, than that in which for so many centuries it had been cultivated by his forefathers, and the idea of its having possibly changed or lost its colour under domestication, would in all probability never enter into the head either of the Chinaman or of his interrogator. Seeing then, as I shall presently show, that the Eastern is infinitely inferior to the European stock, the crossing with seed selected either in India or in China would only be adding to the disease which already threatens the West with such disastrous consequences.

Nature of Experiments explained.

I may, however, be asked, what proof I can adduce of disease and change of colour? As regards the existence of disease there is no occasion to reply, as the fact is only too well known ; but as regards the loss of colour, I have abundant evidence now before me.

All those, indeed, who had the least experience in the rearing of the silkworm must have perceived the occasional occurrence among the brood of one or more dark-grey or blackishbrindled worms contrasting strongly and curiously with the pale sickly hue of the majority. These, by the Franch cultivators, are called "*vers tigrés*" or "*zébrés*," that is, "tiger or zebra striped," and are regarded as a mere variety. Yet these are, in fact, the original and natural worms !

My attention having long since been arrested by this circumstance, it at length occurred to me to endeavour by a series of experiments to ascertain the cause, my conviction being, either that the species had at some time or other been crossed by another of different colours, and that nature, as sooner or later she always will do, was making an effort to separate them ; or that the original colour of the worm had in reality been dark, and an effort was being made to *revert* from a sickly condition to the original healthy starting-point. Acting on this idea I at once determined to assist Nature by giving her fair play, and, consequently, picked out all the dark-coloured worms and reared them separately, allowing the moths to couple only *inter se*, and the same course was pursued with the white worms.

In the following spring the one batch of eggs produced nearly all dark-brindled worms, while the other produced white ones ; sparingly interspersed as before with an occasional dark one ; these latter were removed into the dark batch, which was at the same time weeded of its pale worms.

In the third year the worms were still darker than before, and were always larger and more vigorous than the pale ones, giving likewise larger and better stuffed cocoons.

Unfortunately, just as the eggs of the third year had been deposited and collected, a violent and unexpected gale of wind suddenly upset the whole and irretrievably scattered them abroad. I had, however, seen such good reason for hoping that I might eventually by this method succeed in restoring the constitution of the worm, that I commenced *de novo*, and went over the same ground again.

The eggs with which my experiment was recommenced, were procured in the spring of 1862 from Mr. Cope of Umritsir, in the Punjab, who assured me that they had "just arrived direct from Cashmere, although, from their appearance, I strongly suspect they owed "their birth, parentage and education," to the Punjab, and had been sent by mistake. But however this may be, on their arrival at

Mussooree, I submitted them to the microscope, which at once proclaimed them to be ill-formed and diseased.

This Mr. Cope denied ; nevertheless it was a fact, and as the worms proceeded towards maturity, various phases of disease became apparent, and I can only account for the denial of its existence by Mr. Cope and some cultivators in Bengal, by supposing that they do not know a disease even when they see it. The worst form attacked the worms just previous to their spinning the cocoons, and gave them the appearance of having been sprinkled with ink from a pen. This is, I believe, what the French term being " peppered," or " *vers poivrés* ;" a most expressive and appropriate term.

Nevertheless the cocoons were formed, though, as might be expected, they were thin, papery and greatly deficient in silk ; as cocoons indeed, they where perfect trash, but, as I had a point to ascertain in respect to the silk, I despatched them to Mr. Turnbull of Gathal, an experienced and skilful superintendent of silk filatures, ever willing to oblige, and who had likewise reeled for Mr. Cope of Umritsir, and Colonel Clark of Oudh ; the result was, that my worthless cocoons yielded a silk not one whit inferior *in quality* to that produced by the inordinately-belauded cocoons of the above-mentioned gentleman ; and, indeed, although *in epistolâ* Mr. Cope pronounced Colonel Clark's cocoons to be " the finest he had seen in India," it was declared by Mr. Turnbull, who reeled them, that they had deteriorated 56 per cent. below the Cashmere standard furnished by Mr. Cope himself, and as that standard is itself about 50 per cent. below that of France and Italy, we may safely put down the best Indian cocoons of the true *Bombyx Mori* as being 75 per cent. worse than they ought to be ; and yet, in spite of common sense and twenty-five years' experience, I am modestly required to believe that the worm is not diseased ! What then, in such case, is the meaning of the panic in France and Italy ?

It is to be remembered, however, that all my sickly worms were of the white variety, and that the few dark worms picked out from them escaped disease altogether, although reared in the same manner, in the same room, in the same temperature, on the same quality of food, and in close contiguity to the others. These dark ones in due time spun cocoons and produced moths, which, *inter se*, deposited a fair stock of eggs, with which the experiment was again carried on in the spring of 1863.

I may here observe that it is a well-known fact that the more numerous are these dark-coloured worms in any brood, the healthier is it considered to be, and *ice versâ*.

Now the eggs furnished by Mr. Cope in the spring of 1862 produced very few dark worms, while the eggs from dark worms descended from them produced in 1863 an undue number of white worms, which had to be weeded out, and proving at the same time the extreme weakness of constitution of the stock upon which I was experimenting.

Again, another proof of disease is found in the fact that in the spring of 1862, the eggs received from Umritsir were all loose and detached: this is characteristic of the species whether in India or in Europe, and proceeds from weakness in the glands attached to the ovipositor, and which do not, in consequence, secrete the gum necessary to attach the egg. A few will of course always be found to adhere at first, but so slightly that the least touch causes them to fall.

In the spring of 1863 the eggs obtained in the previous year from the dark stock began to hatch on the 16th of March, and no sign of disease was apparent among them until the moths came forth from the cocoons, when many of these still showed defect in the malformation and dark spotting of the wings. As compared, however, with the previous year there was decided improvement; there were still too many white worms in the brood, but they did not show any symptoms of disease and none died; they attained to a larger size by a quarter of an inch increasing from three to three and a quarter inches in length; they produced, in consequence, larger cocoons, though still deficient in silk, and the moths, although still showing the presence of disease, laid good sized eggs, great numbers of which adhered firmly to the paper upon which they were deposited, and indeed one sheet of paper was thickly covered with them, a thing which, although I have paid attention to this subject for the last twenty-five years, I never witnessed before, nor even heard of it. The eggs of other species will adhere, but to find those of the *Bombyx Mori* doing so is truly a novelty which betokens decided progress towards a healthier condition.

There was likewise another indication of returning strength to be seen in the fact that, while ordinarily the male moths are so sluggish as to make no attempt to fly, many of those produced from my black stock left the trays and flew off to seek the females in a distant part of the room. This is one of the marked characteristics of the wild moth of *Bombyx Huttoni*, which flies off from tree to tree for long distances when "on amorous thoughts intent."

But still more extraordinary appears the fact that some of the eggs of *B. Mori* of the spring crop of 1863 began to hatch *again for a second crop* on the 7th August of the same year; these were all from the dark stock, and the circumstance, in itself perfectly novel, arises, I am inclined to think, from an accession of strength acquired by reversion to a state approaching more nearly to the original constitution.

The hatching continued throughout August, and occasionally even to the 23rd of September, when, fearing that my supply of leaves might fail, the eggs were removed to a temperature below 70° Fahrenheit in order to check the hatching.

The worms now hatched continued to grow and thrive, and spun good cocoons superior in size to those of the spring crop, the worms attaining to $3\frac{4}{10}$ inches in length In due time the moths appeared and were fully twice as large as those of spring, depositing large well-formed eggs. In the beginning of December, to my dismay, more worms were hatched from the spring batch, and continued to come forth throughout the month at the rate of 40 or 50 daily in a temperature of 53° Fahrenheit, when, having no more leaves upon the trees, I was compelled to place the remaining eggs out in the open air at night in order that the sharp hoar frosts might effectually put a stop to any further hatching. All these worms were of the dark kind, and no white ones now appeared among them as in the spring; indeed from the white stock only three worms were produced and these came to nothing. This circumstance, so thoroughly unusual with *Bombyx Mori*, I attribute entirely to an accession of health and strength in the black worms, which are evidently now in a transition state, which may account in some measure for their hatching out of season, so irregularly and in such a low temperature. This, however must close the experiment for 1863, and I must hope for some decided results in the spring of 1864 from the eggs deposited in October, 1863.

In the meantime then I will return to the consideration of what the worm ought in reality to be.

The Dark Worm is the natural Colour.

That the dark colour is the natural one is shown in some measure by the strong similarity, evinced in the disposition and arrangement of the markings, to the wild races of India; while the moth also, instead of remaining so purely white in wings and body, assumes a dark ashy or smoky hue on the body of the males, which is likewise diffused over a great portion of the wings, as in *Bombyx Huttoni.*

Here, then, I think I have already given in the above account strong proofs that the original colour of the worm was dark, and that the pale sickly hue which it has long since assumed is entirely owing to debilitated constitution.

Nor is there here much room for wonder when we reflect how often among our other domestic stock the original colour fades away, to give place to pie-bald, and finally to white. Need I do more than call attention to our domesticated rabbits, our pigeons, domestic fowls, turkey, Guinea fowls, ducks and geese in proof that the more the white colour prevails the further do the species recede from their natural characteristics, and the weaker becomes the constitution. Even our cage birds, as every bird-fancier well knows, exhibit this same tendency to lose their original colours, and become paler and paler, until many eventually turn altogether white.

On this subject, for the purpose of strengthening my argument, I feel that I cannot do better than quote a passage from General Daumas' very able work on "The Horses of Sahara," that writer's views being so thoroughly in accordance with my own.

"It is abundantly apparent," says the General "that legendary traditions and experience are in perfect harmony in according a decided superiority to coats of deep and decided hues. Coats of a light pale colour are held in no esteem whatever. The horse's coat, therefore, must be an index to his character. The long experience of Mahomed the prophet and of Moussa the conqueror must have placed them in a position to speak with full knowledge of the subject, and their opinion confirmed by that of all the Arabs, the best horsemen in the world and the most interested in studying the animal, upon whom indeed depends their honour and their life, is certainly entitled to be regarded with some respect. It is beyond all question that the *Koummite*—red mingled with black, chestnut or bay—is preferred by the Arabs to all others. If I might be allowed to quote my own personal experience, I should have no hesitation in saying that, if there be any prejudice in the matter, I share it with them. Besides, must it necessarily be a prejudice because it may seem to be one? *No one will deny that all the individuals of the same species are, in their wild state, identical in colour and endowed with common instinctive qualities inherent in the race.* These colours and these qualities undergo no alteration or admixture *except in a state of servitude and under its influences, so that if any of these individuals by a return to their natural condition,* more easily proved than explained, *happen to recover the colour of their first ancestors they will be equally distinguished by more broadly defined natural qualities.* The canine race may be taken as an illustration. Whence it follows that a certain number of domesticated individuals being given, their coats alike and with dominant qualities, it may be fairly concluded that this coat and these qualities were those of the race in its wild state. In the case then of the Arab horse, if it be true that those whose coat is red shaded with black are endowed with superior speed, are we not justified in inferring that such was the uniform colour, such the natural qualities, of the sires of the race? I submit with all humility these observations to men of science.

"Abd-el-Kader assures us, moreover, that it is ascertained by the Arabs that *horses change colour according to the soil on which they are bred.* Is it not possible, in fact, that *under an atmosphere more or less light, of water more or less fresh, of a nurture more or less rich according as the soil on which it is raised is more or less impregnated with certain elements,* the skin of the horse may be sensibly affected? Every one knows that with any coat *the colour changes in tone and shade according to the locality where the animal lives, the state of its health, the quality of the water it drinks and of the food it eats, and the care that is bestowed upon it.* There is, perhaps, in all this a lesson in natural history not to be despised, for if the circumstances in which a horse lives *act upon his skin, they must inevitably act also in the long run upon his form and qualities.*" *

Truly does the author here remark, that there is "in all this a lesson in natural history not to be despised," though, doubtless, he little thought how applicable were his observations to the actual condition of an insect of such value and importance to his own countrymen as the *Bombyx Mori.* I have *italicised* those passages to which I wish more particularly to draw the reader's attention, and shall now proceed to show their applicability to my present subject.

That the long-continued domestication of the silkworm has tended greatly to deteriorate its original constitution, the numerous diseases to which it is now subject, in every country where cultivated, furnish ample proof. That imperfect ventilation of the rearing houses produces a vitiated and impure atmosphere, highly injurious to health; that the nourishment derived from the mulberry leaves will be more or less good according to the condition of the tree from which they are gathered; and that the tree itself will be influenced by the nature of the soil and the temperature of the climate in which it grows, are facts of which every observant cultivator is well aware.

As with the horse, then, so with the silkworm; an unhealthy state of the atmosphere in which it is reared, together with an insufficiently nutritious diet, combined with other disadvantages which are incidental to a state of servility or domestication, must sooner or later exercise a very marked effect upon the general health of the animals, and the constitution, being once impaired, will necessarily by affecting the animal functions generally, not only act upon the skin and colour, but engender debility and disease.

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* "The Horses of the Sahara," by Gen. Daumas, p. 20. English Translation.

It is under such circumstances, and when the species threatens to become extinct, that nature's great Guide and Ruler, acting for the creature's good, and with a view to the preservation of the species, invariably makes efforts to restore it to its original characteristics, and these symptoms of *reversion*, if seized and followed up by judicious efforts on the part of man, may enable him, perchance, eventually to cast out disease, and restore the species to its natural colours and original strength of constitution.

Herein consists the entire secret of my experiments with the *Bombyx Mori.* Seeing that a very remarkable difference in colour sometimes occurred, and being fully aware of the truth of General Daumas' remark, that "the colours and the qualities undergo no alteration or admixture except in a state of servitude, and under its influences," I determined to ascertain whether the dark colour of some worms was or was not occasioned by an effort on the part of nature to *revert* to the original point at which domestication had commenced, and that it actually is such is proved, not only by the colours remaining permanent in the black race, which *they do not in the white race*, but by the acquisition of qualities which originally belonged to the species and which the pale-coloured worms do not exhibit. Thus, as the General truly observes, "the recovery of the colour of their first ancestors has caused them to be distinguished by more broadly defined natural qualities."

Still further, we gather from the observations of M. Boitard, that "the black worm, which is so often met with in the north of France, is absolutely unknown in Italy; and yet the eggs, which in France, will produce them, are often purchased in Italy."

Here it is plain, if my views are correct, that climate tells upon the constitution of the insect even in Europe, and that in Italy, where the temperature is high, the black worm is unknown, simply because the heat of the climate, combined, perhaps, with too high a temperature in the houses, enervates the worm and causes it to depart further from its original type than it does in France, where the climate is colder and more favourable to the general health of the insect.

Again, the same writer informs us, that "in Lombardy the worm which produces the white silk will constantly furnish nine white cocoons to one yellow one, although in France, no matter how much care may have been bestowed upon the worm, the yellow cocoons will always far out-number the white ones." Now I have long entertained the idea, that the production of white cocoons is (except in cases where that colour is permanent in all climates) a strong sign of degeneracy, proceeding from weakness of constitution, the rather that such white cocoons are always more abundant where the temperature is high, than in more temperate climates. Hence in Italy the worms, which in that high temperature will constantly produce an excess of white, will in a more favourable situation and circumstances produce an excess of yellow, cocoons. Thus, the *Boro-pooloo* of Bengal (*B. textor*, nob.), which there and in China, as a rule, produces white cocoons, when reared in the colder climate of Mussooree yields almost all yellow cocoons; while to find a white cocoon among the worms of Cashmere (*B. Mori*) is altogether the exception.

Hence I come to the conclusion, that the whiteness of the worm and the white cocoons are both indications of failing constitution, evidencing the existence of a higher temperature and of a more thoroughly artificial treatment than are conducive to the health of the insect. Were the white or the yellow colour to remain permanent in all climates and temperatures, the fact might reasonably be regarded as a specific character, but where, as in the above observations, we perceive these colours to be dependent upon temperature, we are compelled to regard the change as entirely dependent upon the state of health.

Thus heat, by causing debility, undermines the constitution, and gradually changes the natural colours, of both the insect and the silk secreted by it, into a sickly white, while a restoration to a cooler climate will, under proper management, restore the colours to their natural shade, by imparting vigour to the drooping insect.

Deterioration proved.

Those who possess any real knowledge of the subject under discussion will, I am fully aware, require no further proof of the worm's deterioration than has already been furnished above ; yet as there are not wanting some pretended savans, whose private interests prompt them to conceal as much as possible the maladies under which all our worms are labouring, I shall proceed yet further to show, even from their own arguments, how very little they really know upon the subject.

Common sense will at once point out that a worm imported from the northern provinces of China will not long maintain its vigour in any part of the hot lowland provinces of India, and indeed this is fully shown by one cultivator proposing to preserve the eggs of *Bombyx*

Mori by sending them from the Punjab to the mountain station of Durrumsala, as well as by the fact that Jaffer Ali of Mooltan invariably preserves his in a cool underground chamber or *tykhana.*

It is evident from this, that even the heat of the Punjab is far greater than the egg can bear, and if it be inimical and destructive to the egg, it will undoubtedly be equally so to the insect in every other stage. The loss annually sustained by the cultivator Jaffer Ali, even when the eggs are kept in the *tykhana,* is said to be "from a fourth to a third," the heat (even under ground !) drying up the eggs without hatching the worms !* If this can be called successful cultivation then no one need despair !

From this admission it is clear that what actual disease effects in France, where "*la muscardine*" is said annually to destroy more than one-fourth of the worms, is effected by heat, even in an underground cellar, in the Punjab ; how then, in such a climate, can really good results be expected, since the same writer, while trumpeting forth the wonders performed in the Punjab, very naively winds up his laudations with the assurance that "*out of taikhanas the eggs cannot be preserved in the plains at all.*"

As to his assertion that those eggs "that survive the heat are not injured, but produce as healthly and fine worms as if the eggs had been kept in a cool climate," it actually amounts to nothing, unless at the same time we can feel assured that the writer is well acquainted with what the worms ought to be, and can prove that they are as large and produce the same quantity of silk as those of colder climates ; and that such is not the case is proved by the testimony of Mr. C. S. Turnbull, who states that Umritsir-reared cocoons are 56 per cent. below the Cashmere standard !

Indeed this gentleman, who is undoubtedly a good authority, pronounces the cocoons of Oudh and of Umritsir to be about equal, so that they had degenerated in those localities *in one season* 56 per cent. below the standard of Cashmere as furnished by Mr. Cope himself a couple of years before.

Again cocoons raised at Lucknow in Oudh by Dr Bonavia required 5,200 to the pound of silk ; at Candahar in 1840 the Afghans reckoned about 4,500 to the pound of silk ; while in France, previous to the late epidemic, 2,500 cocoons were, on the testimony of Mr. Bashford,† equal to a pound of silk.

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* Powlett's Report in Proceedings Agricult. Soc. of India, 9th July, 1862.

† Journal Agricult. Soc. of India, Vol. IX. p. 261.

Here, then, we have positive evidence that the climate of the Punjab and other parts of the plains of India is injurious to the health and general well-being of the insect.

Now it is also the opinion of Mr. Turnbull that the Candahar and Cashmere yield of silk is pretty nearly on a par; and as from the above statistics the Oudh and Punjab cocoons are at least 50 to 56 per cent. below the Cashmere standard, which is itself considerably below to that of France, we may safely say that the cocoons of the Indian-bred *Bombyx Mori* are little short of 75 per cent. below what they ought be.

What benefit then, I would ask, is likely to ensue from the introduction into Italy of the eggs lately purchased in Cashmere by Dr. Carlo Orio? The worms reared from those eggs will no doubt be improved by the change of climate and more judicious treatment, but they will add nothing to the health and vigour of the European stock.

It has been justly remarked that "there are few individuals who have not watched the interesting changes which take place in the larvæ of the *Bombyx Mori*, or common silkworm, from the point of its exit from the egg until it has reached its full butterfly existence; and many there are who have been sadly disappointed at the mortality which comes over a brood of silkworms in a single night from some cause or causes unknown, and consequently irremediable. Such epidemics are continually occurring in China as well as Europe, and constitute one of the greatest obstacles to the introduction of the culture of the silkworm into England. What occasions this sudden decimation of these insects has never been determined, but has long led to a wish, on the part of those interested, that a more hardy breed of silk-producing worms could be introduced into Europe, even though the produce was coarser and of a worse colour than the ordinary mulberry silk."* Here, then, is a further and very recent testimony to the diseased state of the worm.

Good Quality of the Silk no Proof of general Health.

I shall doubtless be told that "the proof of the pudding is in the eating," and that as silk of the best quality and worth twenty five shillings per pound has been produced in the Punjab, the worm can not possibly be diseased or have lost its constitution.

To this I reply, that in order to test "the pudding" properly and fairly, we require a judge possessed of some knowledge of what a pudding ought to be.

In the introductory remarks to my "Monograph on the Genus

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* Journal Soc. Arts, November 6th, 1863. p. 776.

Attacus," I have shown, after Kirby and Spence and other authorities, that the gum from reservoirs being conveyed to the mouth by the constriction of certain muscles, passes through two small orifices in the lip, and the two fibres thus formed, being taken up and twisted together by the hook-like processes in the mouth appointed to that office, become one fibre of silk on coming into contact with the cold external air. Now these two orifices in the lip are expressly appointed to the purpose of regulating the thickness of the silken fibre with which the cocoons are formed; they are a provision of Nature which determines the thickness of the silken thread, and that thickness, in worms of equal size, will be constantly uniform, so that a large and healthy worm will yield a thicker fibre than a smaller and degenerated worm.

As long as the reservoirs contain gum, the thickness of the silk will be the same whether the worm is diseased or not, provided always that the worms are of equal size; and simply owing to the regulating organ above mentioned. The quality of the silk comprises thickness of fibre, tenacity and elasticity, and where the secreting glands are not affected by disease, this quality, from worms equally well fed, will be the same even where the general health of the one is far inferior to the other; indeed it is the quantity, rather than the quality of the silk that is affected by the maladies under which the worms are now labouring. The cocoons reared in Oudh by Colonel Clark, and pronounced by Mr. Cope, *in epistola*, to be "the finest he had seen in India," produced on being reeled a silk of precisely the same quality as that produced at Umritsir, and by my Mussooree cocoons reared from Mr. Cope's supply of diseased eggs in 1862, and which, as cocoons were absolutely worthless, there being little or no silk in them. Dr. Bonavia's cocoons, raised in Oudh in 1863, from seed furnished by Mr Cope, yielded a silk in no respect inferior to the above, although the pound of silk requiring 5,200 cocoons to produce it proved how terribly deficient was the quantity of gum secreted. In cases where the glands are affected by disease, or where the leaf has not contained a proper proportion of silk-yielding matter, no silk at all will be secreted, and the worm will either die as such, or become a pupa without spinning. Many cases of this kind occur in all the broods, whether monthly or annual.

To talk, as some do, of coarse leaves producing a coarse silk, and therefore recommending the use of such as are thin and tender, is at once to prove non-acquaintance with the anatomy of the insect and ignorance of the whole art of nourishing the worm, since, as already pointed out, the thickness of the silk fibre is regulated by Nature, and inasmuch as it indicates the decreasing size of the orifices, consequent on the deterioration and degeneracy of the worm. The orifices in the lip being of regulated size, no extra-natural coarseness of fibre can be produced, and no coarseness of leaf could ever make the fibre thicker than Nature intended it to be, or than those orifices were capable of admitting, simply because it is a well ascertained fact that "a camel cannot pass through the eye of a needle."

Remarks on " the Diet of Worms."

Having been frequently applied to from different quarters for information as to the best kindof mulberry leaf on which to rear the silkworm, it may be as well perhaps to give the result of my own experience, and leave each inquirer to please himself as to the species he may find it most convenient and most suitable to adopt.

The question then is, " what species of mulberry tree is best adapted for the nourishment of the silkworm, and for the production of good silk ?"

Were all climates alike the question might be easily answered, but in its present form it is too vague and general ; besides which, thus put, it assuredly implies a belief that we have only one species of silkworm under cultivation, and that whether monthly or annual, all come under the head of *Bombyx Mori*. This, however, is not the case, the name of *B. Mori* belonging of right to the worm known in India as the Cashmere worm, which is an annual, and is cultivated in Afghanistan, Bokhara, Persia, Syria, Italy, France and other European countries. It was originally brought from the northern provinces of China, where the country is mountainous, and the climate, especially in winter, very severe and cold. There is also another worm cultivated as an annual in Bengal under the native name of *Boro pooloo*, which means " large cocoon," it being the largest species of *Bombyx* under cultivation in Bengal. As compared with the cocoon of the Cashmere worm, however, it is very much smaller, of a different form and texture, and yielding generally a pure white silk, although, as already observed, in the colder temperature of Mussooree the yellow cocoons are at least quite as numerous as the white. This likewise is from China, and from its being an annual is supposed, with good reason, to be a native of the northern parts of that country. This species I have named *Bombyx textor*, as it is totally distinct from the Cashmere worm.

Three other species domesticated in Bengal are respectively termed the Madrassee or Nistry,—the Dasee,—and the small Chinese monthly worm ; these three are termed monthly worms because they yield from six to eight crops during the year. These I have respectively named

Bombyx Crœsi, B. fortunatus and *B. Sinensis*, while from the fact of their yielding several crops a year I am inclined to regard them as belonging to the warmer and more southern parts of China, the number of broods indicating a climate in which food is abundant throughout the year, while the annuals on the contrary, as every naturalist is aware, indicate a far more temperate climate.

Besides these there is said to be another species cultivated in Arracan which yield a silk superior to that of the Bengal worms, but as I have been hitherto unable to procure it for examination, I can do no more than indicate its existence and name it provisionally as *Bombyx Arracanensis.*

Seeing, then, that this diversity exists among the worms, it is but reasonable to infer that in their native countries and in a state of nature, they did not all feed upon the same species of mulberry leaf, but that the annuals, like the wild *Bombyx Huttoni* of the Western Himalaya, were originally restricted to the trees indigenous to the cold mountainous regions of the north of China, while the monthly worms were in like manner confined to species adapted to the greater heats of the southern lowland provinces.

The question, then, as to which is the tree best adapted in India or elsewhere, for the production of good silk, although apparently a very simple one, is in reality not easily answered, since much must depend upon the species of worm under cultivation, as well as upon the climate itself, and the difficulty is enhanced by the fact that every one who, possessed of much zeal but little knowledge of the subject, essays to rear silkworms, appears to think it necessary to extol some particular species of mulberry, and to pronounce it, for the time, the very *ne plus ultra* of silkworm diet.

One while it is the white-fruited mulberry only that can enable the insect to elaborate good silk, and anon, for some inexplicable whim, the white is discarded and another tree adopted in its stead. The purple-fruited species are unhesitatingly denounced, and to be "condemned without benefit of clergy."*

And yet the white mulberry is found to be nothing more than an Albino variety of the purple-fruited tree.

Count Dandolo long since pointed this out; and I have myself sown the seed of the dark purple mulberry, known to the natives as the "*Siah Toot,*" and found that several of the young plants produced therefrom eventually bore white fruit only, the shape and flavour being entirely changed, and in some respects the leaf also. To my surprise, moreover, three young trees, said to be from Cashmere, and which for the past three years had borne white fruit alone, were this season (1863) covered with purple-fruit.

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* Proc. Hort. Soc. of India, 10 August, 1859, vol. xi. part 1, p. 64.

The difference in the quality of silk reared respectively upon these two kinds - which are thus in reality not two, but one and the same—must be to a very great extent purely imaginary, and I will venture to assert that if two skeins of silk thus grown, that is to say, the one from the purple and the other from the white fruited tree, were placed before any cultivator in India, he would not be able to distinguish between them.

Of the *Morus alba*, Count Dandolo remarks,—"This species comprises the common wild mulberry, which has four varieties in the fruit—two have white berries, one red and the other black."

Here, then, the merest tyro may perceive that the red berry merely forms the connecting link between the black and the white fruit, and consequently that there can be but little, if any, difference in the quality of the leaf; indeed, all that the Count ventures to observe on the subject is, that "the leaf of the black mulberry, hard, harsh and tough, which is given to the silkworms in some of the warmer climates of Europe, in Spain, in Sicily, in Calabria and in some parts of Greece, &c., produces abundant silk, the thread of which is very strong, but coarse. The white mulberryleaf of the tree planted in high lands exposed to cold dry winds and in light soil produces generally a large quantity of strong silk of the purest and finest quality."

Now, if by the term "coarse," as here applied to the silk raised from the black mulberry, is meant *thick as to fibre*, the difference is seemingly of little importance, and would be overcome, I should imagine, in the reeling by assigning fewer fibres to the thread; while that the produce of the white mulberry is not uniformly the same or to be depended upon is shown in its being only "generally," and not always, of the finest quality; and moreover "the finest quality" does not necessarily imply *thinness of fibre*, but may refer to other qualities, such as evenness, tenacity and elasticity; while, with regard to the degree of coarseness above alluded to, it must be borne in mind that it could not possibly be coarser than nature intended it to be, because the regulating orifices in the lip would prevent it. Besides which it is extremely questionable whether "high lands exposed to cold dry winds" and with a "light soil" are suitable to the mulberry tree, especially in such high latitudes; and if not, then the worms fed upon the leaves of such trees would be naturally less healthy and of smaller size than those reared under more favourable circumstances, and consequently, the worm and the labial orifices being smaller, the silk would of necessity be finer. This, however, is not an argument in favour of the white mulberry, but against the locality in which it is grown. Seeing then that the silk cannot be coarser than nature intended it to be, while it may be much finer, the argument tends altogether to prove that great fineness of fibre is a consequence of decreasing size in the worm, produced by increasing debility of constitution.

M. Boitard, a French writer on the cultivation of silk and of the mulberry tree, informs us that the white mulberry is often tinged with red, a statement which upholds and confirms my remarks that the red holds an intermediate place between the black and the white fruit.

In 1858 the white mulberry appears in some quarters to have fallen in estimation, and the *Morus multicaulis* was likewise condemned, as it was said, "because it produces so few leaves, though they are larger, and partly because those few are too soft and milky for the worm, yielding a weak fibre."*

This statement, however, unfortunately proved to be an egregious blunder, the tree thus denounced being in reality not the *Morus multicaulis*, which, as the specific name points out, instead of having few leaves of large size, has a multitude of branches thickly covered with a moderate-sized leaf. The large-leaved tree is now named *Morus cucullata*, from the leaf taking the form of *a skull cap*, and strange to say, although pronounced to be worthless when supposed to be *M. multicaulis*, was subsequently, by the same authority, and under the equally erroneous name of *Morus Sinensis*, extensively cultivated as a first-rate silkworm diet.

Whatever may be the value of *M. multicaulis* and *M. cucullata* in their own native climates, they do not appear to have given much satisfaction elsewhere, and certainly in a cold northern climate they can scarcely be expected to do so; at Mussoore, I regard them both as trash, and although in Oudh, Dr. Bonavia found that *B. Mori* and *B. Sinensis* both ate them readily enough, yet in the later stages of the worm a leaf of greater substance was required. In such case I would recommend the coarser leaf from the very beginning, for if the young worm lacks sufficient nourishment in the two first stages of its growth, it will be next to impossible, by any amount of subsequent good feeding, to recover the ground thus lost.

It is, I am convinced, precisely because in the early stages the worms have been fed upon chopped and thin watery leaves, that the constitution has been at length brought to the very extreme of weakness. Starvation in childhood is surely not the best method of eventually producing either a strong healthy man, or any other animal!

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* Journ. Hort. Soc. of India, vol. x. part 2, p. 182.

The climate, the tree, and the species of silkworm to be reared should all,. as much as possible, be adapted to each other; whereas under the present system the cultivator appears to think that climate, food and the constitution of the insect are all mere secondary considerations to be set at naught, and disregarded with impunity, and then wonders, because he has steadily pursued certain stereotyped rules, at the failure of his speculation

Lest, then, this blind laudation of certain species should lead to mischievous results and disappointment among those who are desirous of entering into the speculation, I shall here beg leave to call the attention of the sericulturist to the well-known fact, that "what is one man's meat is another man's poison," and remind him that diet which is admirably adapted to keep up animal heat and to nourish an individual in the vicinity of the North Pole, will be found both unsuitable and highly injurious to health in lower and warmer latitudes. We have but to cast a glance around us in order to perceive that each nation, according to its climate, differs somewhat from another in the matter of food; those of the warmer parts of the world being more frugal and less gross in their diet than those of the colder regions. Is it not proverbial, that where a Frenchman, content with thin wines and a few field herbs wherewith to make a salad, would thrive, an Englishman, addicted, as he is, to strong ale, with an unlimited allowance of beef and bacon, would starve outright? The raw seal blubber, so palatable to the Esquimaux, would be wholly unsuited to the more temperate countries of Europe, and, as a rule, we find that the diet is the simplest in the hottest regions, and becomes gradually more gross as we approach the north, where the cold requires the use of more solid and stimulating food to promote and keep up the animal heat of the body.

Something of the same kind is assuredly perceptible also among the feral tribes; the bears, for instance, being far more carnivorous in high latitudes than near the tropics, where fruits, vegetables and insects constitute the animal's food; but confining my remarks for the present to the larvæ of the *Bombycidæ* or silkspinners, we find that nature has ordained that the species in different latitudes shall feed upon different trees.

It may be said that this arises from the fact that the same trees are not found in these different localities, and consequently that the insects are compelled to seek another food, or to starve ; this, however, does not appear to disclose the true philosophy of the question, and it certainly does not prove that such food in southern regions is equally stimulating with that of northern climes, but rather that instinct teaches the insect to accommodate itself to the provisions provided for it precisely as a traveller to the northern regions makes use of pemmican, which he discards on returning home. There are indeed not wanting proofs that even where the food of one latitude exists in another, the insect will refuse to eat it, as if aware that it is no longer suitable to its wants ! The truth seems to be this, that where a tree and an insect have existed together in, perhaps, a southern latitude, and the tree ceases to grow in some more northern locality where the insect is still found, it is because the tree in the colder locality would no longer be able to furnish a sufficiently stimulating diet, and is therefore, replaced by one more suitable to the wants of the insect. And this after all is simply one of those wise provisions of nature whereby her productions and the conditions under which they exist are mutually adapted to each other.

As a proof of this we find that although the larvæ of the beautiful *Attacus Atlas* are known in Kumaon to feed freely and principally upon the leaves of the yellow-flowering barbary *(Berberis Asiatica ?)*, called at Mussooree *Russote*, yet with us, where the plant is equally common, I have never yet succeeded in inducing the worm to touch it nor have I ever found either the larvæ or the cocoons upon this shrub. And yet out of fortysix cocoons now before me from Kumaon no fewer than fortythree have been spun among the leaves of *B. Asiatica !* Surely this looks like a case in point ; besides which it is an unquestionable fact that among the mulberry trees which are known to be true species, and not mere varieties, the leaves of those from the north possess far greater thickness, consistency and nourishment than those from the tropics or warm lowland provinces. Take for example the leaves of *Morus multicaulis* and of *M. cucullata*, as compared with those of *M. Sinensis*, *M. nigra ?*, and the wild indigenous trees of the North Western Himalaya.

At Pondicherry, according to information derived from my obliging correspondent M. Perrottet, the *Actias Selene* is entirely restricted to the *Odina Wodier* of Roxburgh, while at Mussooree it is polyphagous, feeding on *Coriaria Nepalensis*, *Carpinus bimana*, *Andromeda ovalifolia*, *Cedrela paniculata*, the common walnut, *Cerasus puddum*, or wild cherry, *Pyrus variolosa*, and several others. Again, *Attacus Cynthia*, which in China is nourished on the leaves of *Ailanthus glandulosa*, feeds in Cachar upon a tree called "*Lood*," and at Mussooree on *Coriaria Nipalensis*, *Xanthoxylon** *hostile* and some others; and so on, indeed, throughout the family.

The wild indigenous mulberry of Mussooree, with thick coarse leaves full of milky juice, is often so thickly covered with the larvæ of *Bombyx Huttoni*, that by the beginning of May there is not a single leaf upon the tree wherein the worm can spin its cocoon; yet although the thinner-leaved cultivated mulberry may abound in the immediate neighbourhood, it never by any chance experiences the same treatment; so that taking the hint from nature, I am inclined to recommend for the *Bombyx Mori.* when cultivated in the upper provinces, and more especially in the hills, such leaves as those furnished by *M. nigra ?*, *M. Sinensis*, *Bèdana* or seedless long white mulberry, and others of the thick rough-leaved kinds.

At the same time it is highly probable that certain species, which are wholly unadapted to a cold hill climate and the action of severe frost, may thrive well in the lowland provinces of India, where they will likewise be suitable to the worms of warm localities, such as I consider the Bengal monthly worms to be. But to extol in general terms one species above another, and endeavour, on wholly insufficient and often purely theoretical data, to persuade people it is the best adapted for the nourishment of the silkworm,—the species of the worm, moreover, not being specified,—is, in my opinion, the surest way of propagating pure sophistry and of insuring the failure of speculations in other districts, which, from the nature of their climates, require both a different diet and a different mode of treatment.

There is, moreover, yet another point to be considered, for although certain trees, such as *M. multicaulis* and *M. cucullata*, may thrive well enough in the Punjab and the Gangetic provinces, yet it is more than doubtful whether the Cashmere worm will thrive upon them; for while the trees delight in and are adapted to a worm lowland temperature, the insect, whose cultivation is becoming fashionable in the upper provinces, is from the northern mountainous tracts of China, situated between 32° and 34° of north latitude, whereas in our Hymalayan regions frost and snow are the accompaniments of winter. The cultivator should remember that a northern insect requires a northern tree, and the northern tree requires a northern climate, and that he himself requires a certain amount of knowledge and the exercise of common sense.

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* In previous papers this word has invariably appeared as *Xanthophyllum*, which is an error.

Trees producing leaves of extreme thinness, like those of *M. multicaulis* and *M. cucullata*, are far from desirable on account of their containing but little nourishment, and necessitating a larger and more frequent supply. A good and healthy leaf should contain the four ingredients of fibre, water, saccharine and resinous matter; the two first go directly to the nourishment and growth of the worm, while from the two latter is secreted the supply of gum which eventually furnishes the silk. Where the two former only are found, or where they are greatly in excess, as is sometimes the case, the worm will grow and attain to a goodly size, but will produce little, or perhaps no, silk. In breaking off a good healthy leaf, a drop or two of thick milky viscous juice should exude from the stalk, and in this resides the silk-producing matter; the *Morus Sinensis* and all the thick-leaved trees possess this in far greater quantity than either *M. cucullata* or *M. multicaulis*, and indeed from the latter species, when grown in a cold climate, it is almost absent, being thin and watery.

Yet after all, it has long since been laid down as an ascertained fact, that however much *the quantity* of silk may be dependent upon the presence of this juice, *the quality* is far less dependent upon the good properties of the leaf than upon the temperature in which the worms have been reared; so that where this is higher than the constitution of the insect is fitted to endure, no matter how well it may have been fed, the yield will always be inferior to that produced in a more genial temperature; and that the *Bombyx Mori* of Cashmere is greatly influenced even by the heat of the Punjab, is proved beyond all contradiction by M. Perrottet's observation, *in epistolâ*, that eggs deposited there and sent to him by Mr. Cope of Umritsir, were inferior in size, and far more irregular in form, than those sent by me from Mussooree, where the climate is better adapted to the species. The fact is moreover fully established by the annual loss sustained by Jaffer Ali as above narrated, as well as by Mr. Cope's expressed intention of sending his Punjab-bred eggs to the hills during summer, and of importing annually fresh seed from Cashmere. The same remark is equally applicable to Oudh.

That the thinness of the leaf, both in *M. multicaulis* and *M. cucullata*, is a very serious defect may be gathered from Count Dandolo's remark, that "the less nutritive substance the leaf contains, the more leaves must the silkworm consume to complete its development. The result must, therefore, be that the silkworm which consumes a large quantity of leaves that are not nutritive, must be more fatigued and *more liable to disease* than the silkworm that eats a smaller proportion of more nutritive leaves. The same may be said of those leaves which containing a sufficiency of nutritive, contain little resinous substance; in that case the insects would thrive and grow, but probably would not produce either a thick or strong cocoon proportionate to the weight of the silkworm, as sometimes occurs in unfavourable seasons. "My experiments," continues the Count, "prove in the ultimate analysis that, all things balanced, the qualities of the soil produce but a very slight difference on the quality of the leaf; that which will appear most evident is, that the principal influential cause of the fineness of the silk is the degree of temperature in which the silkworm is reared. It is neither the water nor the fibre of the leaf that nourishes the silkworm and renders the cocoon heavy, but *the resinous and saccharine substance.*"

The concluding sentence, however, is scarcely to be relied on, since the worm in its growth is undoubtedly nourished by the water and the fibre of the leaf, although it is equally true that the weight and thickness of the cocoon depend upon the presence of the other substance, while it is necessary to guard against the error of endeavouring to produce too much fineness in the silk, since I have already shown that to be an indication of too high a temperature and of the consequent degeneracy of the worm. Besides which, that the soil must in some measure act upon the quality of the leaf can scarcely be doubted when we consider that it is from the soil that the tree derives its nourishment, and the changes which occur both in the shape and substance of the leaf and in the colour of the fruit can be attributed, I imagine, to nothing else.

In regard to the treatment of the trees, it has been justly remarked that they may be very seriously injured by too close plucking; it has been forgotten, however, by those who in India have laid some stress upon the fact, that the remark applies rather to the mulberry trees of Europe and other temperate climes, than to those of tropical regions; for in the former there is too short a summer to enable the tree to produce fresh leaves without an injurious effort on the part of Nature;* whereas in tropical and neighbouring climates, where the summers are warm and long, and otherwise conducive to the growth of vegetation, the dread of injury need scarcely be entertained. Nature, indeed, herself points out that such is the truth, for in the Himalya the indigenous mulberry trees may often be seen in the early part of May without a single leaf upon them, all having been devoured by the first or spring-brood of the larvæ of *Bombyx Huttoni;* and yet in about three weeks afterwards, or even less, the same tree will be found to have again put on an abundant and healthy foliage ready for the second or autumnal brood of the same worm. This sometimes goes on year after year without the least apparent injury to the tree, and even cultivated kinds are often stripped of every leaf and berry by the monkeys *(Semnopithecus schistaceus)*, and yet put forth a second crop of both. What, therefore, Nature does, man may surely, in similar situations and under similar circumstances, imitate with like success.

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* Mr. Moore informs me that eggs of *B. Huttoni* hatched in April, when there were yet no leaves.

Many things, indeed, in regard to the rearing of the silkworm, have passed into laws without the persons who adopt them having the slightest notion why they have done so, or even caring to reason on the subject;—thus we have one law forbidding more than a certain degree of denudation of the foliage, which is strictly applicable to northern climates only, and necessitates the planting of an additional number of trees. Then, again, another law enjoins that no moisture must remain upon the leaf for fear of injury to the worm; and yet in a state of nature we must feel assured that the leaves are often wet with rain and dew without doing injury to the worms that feed upon them; why then are they injured when in a state of domestication? Simply because Nature always feeds her worms with the best and freshest leaves, and in that state no injury ensues, as I indeed have often proved even with domesticated worms; but if the leaves, as is too generally the case, from being closely packed, brought from a distance in the heat, and kept for hours before they are given to the worms, have begun to fade and lose their natural freshness, the moisture on them, by imbibing the exhaling gases, will act as an active poison on the worm and kill it.

Again, where the temperature of the rooms can be kept down to 80° of Fahrenheit, it is obstinately asserted that the constitution of the worm cannot suffer; yet such reasoners forget that in a warm climate they can only keep down the temperature by shutting up the house and excluding heat, and that in so doing they cause malaria to arise among the worms and ordure by the exclusion of every breath of that pure fresh air which is so essential to the insect's healthy existence.

Lastly, chopped leaves must likewise be compassionately given to the new-born worms, for fear the hardness of the leaf should *hurt their* *gums*, and give the tender brats *the tooth-ache.** Not a breath of wind, not a change of temperature, must pass over these tender beings, for fear the destroying angel should stretch forth his hand and ruthlessly exterminate the whole. But common sense would fain inquire,—"Is the worm naturally of so tender a constitution that no change must be suffered to come nigh its dwelling? If so, how did the insect contrive to brave the storms, and outlive the daily changes of temperature, even from day to night, when exposed upon the trees in its own native and northern mountain climate? Nay why was such change from day to night ordained if it were to prove injurious to organic structures?"

I have proved, however, at Mussooree, that the worms of different species, even in their present debilitated state, are not so delicate as it has hitherto been the fashion to suppose, and have successfully reared great numbers of worms that were night and day exposed to every change of temperature, to every gale that blew, and above all to the constant moisture of the mists which were permitted to pass through the room, saturating leaves and trays, and causing the worms themselves to sparkle through the moisture deposited upon them. Yet notwithstanding this rough treatment no deaths occurred, no particular diseases showed themselves and the cocoons produced were pronounced by competent judges to be good and the silk of the best quality.

They have likewise been successfully reared in France in the open air, and the cocoons are pronounced to be superior to those reared within the house.

And yet, after all, seeing that the constitution of the insect has been completely destroyed, what wonder if it be found unable to bear up successfully against the sudden changes of temperature of a foreign climate? Too great a degree of heat,—an improper system of feeding,—the exclusion of fresh air from the rooms, and, above all, the long-continued system of breeding in and with debilitated stock, have at length reduced the worm to the condition of a *leper*, and have banished from its skin every trace of those colours with which Nature had originally ornamented it. Even in Europe it has been found that heat is inimical to its health, for not only in Italy is the best silk produced in the mountainous parts of Piedmont, but M. Guérin-Méněville, in a tour made in 1858 through France and Italy, likewise declares that it is in "those elevated localities where the vine and the mulberry escaped disease, that the worm was found to enjoy the best health."

This indefatigable naturalist also notices a custom which has long struck me as being most objectionable, and one which has most certainly contributed in no slight measure to destroy the strength and healthiness of the worm. "Nature," observes M. Guérin-Méneville, "distinctly shows that it is her wish that the sexes should remain coupled for a certain time, and that time is generally from ten to twelve hours, and often more."

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* Journ: Hort. Soc. of India, vol. x. part 2, p. 182.

Yet, notwithstanding the truth of this remark, it has become the custom, after Count Dandolo, whose opinions are not always to be depended on, to separate the sexes at the end of five or six hours, and the unavoidable consequence is, that while half the eggs remain altogether unimpregnated and wasted, the other half will produce weakly and sickly worms. It naturally follows then, from this unnecessary interference with Nature's mysteries, that the worms produced are pre-disposed to disease, and as this goes on year after year, and has done so for centuries past, of course the worm becomes more and more degenerated and debilitated..

Surely even here a useful lesson may be learned from the proceedings of the wild species, since every one who has tied out the females of any of the larger *Bombycidæ*, such as *Antheræa* or *Attacus* must have observed that the wild male found coupled with the female in the morning, will, if unmolested, remain so until after sunset, when a voluntary separation takes pleace.

Conclusion.

That matters, as regards the silkworm, are in a very critical and unsatisfactory condition, is fully acknowledged by the French cultivators, but I very much doubt if they have adopted the best means of checking the various maladies with which the insect is beset. Quacks, doubtless, will be found in numbers ever ready to extol some secret nostrum, but the remedies hitherto applied to cure particular phases of disease are calculated to exercise but a temporary effect, and do not by any means strike boldly home and remove the causes from which the maladies arise ; hence in 1861, it was feared that the yield of silk throughout all France would scarcely rise to one-half the return given in previous years. Perfectly useless is it to seek in foreign lands for a healthier and more vigorous seed, since the loss of constitution is universal, and I confidently aver that nothing short of the re-discovery of the insect in its original state of nature, or of the complete restoration of the constitution of the domesticated stock by causing the worm to *revert* to its pristine colour and characteristics, will ever be able to avert the doom which now appears to be impending over the whole domestic stock of *Bombyces*.

The mode of doing this is as simple as could be wished. Nature, ever watchful over the welfare of her productions, herself points out the course to be pursued, and invites us to profit by her wise suggestions, when she gives us so broad a hint of the true state of affairs as to place before us in almost every brood of domesticated worms a few dark individuals, as if for the express purpose of attracting and fixing the naturalist's attention, and compelling him to adopt a method of perpetuating that dark race. Let the sericulturist separate these from his general stock, and set them apart for breeding from; let him annually weed them of all pale-coloured worms, and in the course of three or four years he will be enabled to cast aside his present sickly colourless stock, and rejoice in the acquisition of a worm far healthier than ever it has been since the day when it was first imported from the east by the enterprising monks to whom we are indebted for its introduction into Europe. [*Transactions Entomological Society of London.*]

THE VALLEY OF BERAR,—ITS AGRICULTURAL RESOURCES.

As I ascended to Chikuldah, on this occasion, I had an opportunity ing what features the hills presented on this side, and of over-ing the Valley of Berar, which lay stretched at our feet. This rich Valley, the most valuable of the Nizam's possession, has since passed into the hands of the British Government, for I am writing of years ago, when I was in the strength and vigour of early manhood. The soil for the most part is a rich alluvium, black in colour, very adhesive when moist, but under the influence of a dry sun and hot wind becomes either baked to the consistency of a sundried brick, or reduced to a fine impalpable powder. Nearer the hills, and in some localities where the ground is much broken by rocky excrescences, the soil assumes a reddish tinge, and is lighter, more porous and friable than the black soil; it consists of alumina, oxide of iron, and manganese, but contains very little lime. Decayed vegetable matter, portions of plants and dead leaves washed down from the hills, form the chief parts of its organic matter. It is soil of this description, and which much resembles that of some parts of Georgia in the Southern States of America, that I believe the English settler would find best adapted for the production of exotic cotton; while the black soil, under his careful supervision, might be made to produce a far superior staple than that generally derived from the indigenous seed. It is on these plains, or in valleys but a little elevated above them, within the hills, that the settler would have to cultivate cotton, and while there are sites, as I subsequently ascertained, where tea and coffee might be grown to great advantage, I believe, for cotton, no land in the interior presents so many advantages as the Valley of Berar, in contiguity to the southern slope of the Sathpoora Hills.

The Valley of Berar, even in its parched and dried up state, is a glorious sight from the hills above ; the very aspect it bears is one of wealth, comparatively speaking, presenting to the view so little jungle and such a breath of culturable land. One of the most pleasant features, perhaps, to a casual observer, is the prevalence of large topes (groups) of magnificent mangoe trees. The villages generally lie embedded in a forest of these valuable trees, and near Elichpore there is a garden known as the "Lukh-bund," which derives its name from the hundred thousand mangoe trees it is said to contain. Sugar cane, a most profitable crop—indeed, I may say, with the exception of such crops as tea, coffee, and spice, the most so—is raised in the Berar in considerable quantities, and its cultivation would be still more general but for the very defective means of transport to the coast. This the railway will, however, shortly remove, and affords a means of transit of all produce to Bombay, the necessity for which has long been felt as a serious drawback to colonization prospects in Sathpoora. In the Berar, water is generally obtained in large quantities from within ten to fifteen feet of the surface, and is raised for purposes of irrigation by means of a leather bucket, a rope running over a wheel, and attached to the yoke of a pair of bullocks. Sugar cane requires constant moisture, and notwithstanding the care requisite in its culture to ensure an abundant crop, and consequent outlay, it is nearly, if not quite, the best paying crop in the Berar, if we except cardamoms, which are raised about Elichpore, and from which spice the city derives its name, "Elaichee" being the native name for the spice. Hemp (sunn) is another product of this valley, and to which the settler might with advantage turn his attention, for, with improved cultivation, and appliances for producing the fibre from the plant, with proper screws for pressing and packing it, a good return might be secured The decrease in bulk would alone considerably reduce the present charges for transport.

The climate of the Berar from October till the middle of March is all that man could desire. During these months the settler would hardly care to reside upon the hills, but from that time till the end of June the heat is excessive, and the nights oppressive in the extreme. During the day a strong breeze blows, hot as the breath of the furnace ;

but by filtering it through grass screens, kept constantly wet, the house during the day is made bearably cool, but at night not a breath of air stirs, and the heat becomes so insufferable as to destroy sleep. It is at this time the settler would so enjoy his mountain home, nor would he have occasion often to leave it. The rains first fall about the 20th of June, continue for about ten days or a fortnight, and then hold up for fifteen or twenty days. This cessation of rain is the time employed in ploughing and preparing the fields for seed. The hot wind has then ceased, and though the sun is exceedingly powerful, and draws from the earth a heated moisture which is by no means pleasant, it is not unhealthy, and the settler might well superintend the preparation of his land. Just before the first fall of rain is expected, early in June, manure is spread over the ground, and when the *chota bursàt* (little rains) above described are over, this is turned in with the plough. It has this advantage—that the richness of the manure is in a measure washed out, and pretty equally distributed over the land. The introduction of the light cotton plough, manufactured by Messrs. Howard, of Bedford, made expressly for running furrows between the cotton plants, would be attended with greater advantages, the native plough but very imperfectly turning the soil—it rather cuts into than turns the earth, and is consequently drawn in every direction over the field, leaving of course no even furrows, which are the delight of the orderly systematic English farmer. It seldom answers in India to plough deep; the light one-horse Howard plough is therefore the best adapted to the cultivator in that country. There are many modern appliances in general use on farms in England and America which the settler would find the advantage of on an Indian farm, but it would be useless his encumbering himself with anything of the kind until he had fixed upon the site for his grant, had made himself thoroughly acquainted with the nature of the soil on the various levels, and by such knowledge had determined on the crop he would produce. One thing the settler must never have out of sight—that in producing crops of the description raised by the natives, he can only hope to compete with them by bringing superior knowledge of the properties of the various soils on his farm into play, and by tillage suited to their requirements causing them to yield crops, both as to quality and abundance, far above those his native neighbours can make their fields produce. The native's mode of life is so inexpensive, his requirements for food and clothing so few, that the smallest return the earth will yield for the labour employed on it will suffice for all his wants. He can, therefore, always undersell his far more expensive European neighbour. To compete with him, then, the European's crops must so exceed his in quantity and quality, as in the first place to command a better price, and in the second, from their abundance, to make the time and money expended to them profitable. The European must make the earth yield for him her richest fruits, or he will scarcely succeed as a farmer of the land himself, though he may, by granting leases of his estate to native cultivators on easy terms, with the proviso that they cultivate their grants or a portion of them under his supervision, with such crops as he requires, at certain fixed rates, payable by him. In this latter case the settler should keep a home farm for raising seed alone, with which to supply his tenants, and by this means he will ensure abundant crops of better quality than if he allow them to take for seed grain indiscriminately gathered from the fields' produce.

These are all subjects it will be well for intending settlers in India to bear well in mind and never to lose sight of, for they are the key to success in all undertakings of the kind by Europeans. No more fatal mistake can be made than by the European settler imagining he can compete with the native on his own terms. The native will undersell him in everything, and will prove more than his match in taking advantage of a rise or fall in the markets. It will therefore be by excelling him in every way, in quality and quantity of his produce, that the European can alone successfully compete with him.—*(Forest life in the Highlands of Central India. Sporting Gazette.)*

Correspondence and Selections.

REPORT ON THE CALCUTTA EPIZOOTIC OR CATTLE DISEASE OF 1864.—BY DR. C. PALMER, PRESIDENCY SURGEON.

To. S C. BAYLEY. ESQ.
Junior Secretary to the Government of Bengal.

Dated the 7th October, 1865.

SIR,—I HAVE the honor to forward my report on the Cattle Disease which appeared in this neighbourhood in 1864.

I regret very much the great delay in submitting this: practically, however, this delay has been of advantage, and has added much to the interest of the subject. I am convinced that the disease now raging in England is the same we had here in 1864. I am persuaded it is a disease which for years has existed extensively in India, but which has up to this time not been recognized, and I am hopeful that it is amenable to treatment. Occasional or sporadic cases of a mild character are frequently met with and are successfully treated.

Should His Honour consider this Report of sufficient worth to be printed, I shall be glad to lend you any assistance in correcting the proofs.

The year 1864 will be memorable in the annals of Bengal as that in which the first Agricultural Exhibition was held in India. The collection of animals of various kinds was such as the most sanguine promoters of this great, and successful undertaking scarcely ventured to anticipate. The accommodation laid out in the spacious grounds of Belvidere was however ample. There was no crowding of the varied, numerous, and interesting gathering of cattle, horses, goats, &c.; all of which were kept distinct and separate, were well housed and cared for, and the space allotted was all that was required, either individually or collectively. It was not long, however, after the opening of the exibition on the 24th January, that one of the cows exhibited, was taken ill and died. Several exhibitors took alarm and early removed their cattle; a rumour fast gained ground that a "Murrain" had broken out. This fear was soon confirmed by the fact that other cattle became ill and died; and it was considered so serious that the subject was brought officially to the notice of Government, and the Government was requested to take the matter into consideration and cause an investigation to be instituted and reported upon. The Agricultural and Horticultural Society of Bengal, through the representations of Mr. John Stalkartt, took an active part in the enquiry, and suggested to His Honor the Lieutenant-Governor the appointment of a medical officer to assist, or rather to conduct, the wished for enquiry. In compliance with that request, the writer of this paper was directed to carry out the views of the Society, and furnish a report on the nature and history of this "Murrain," and, if possible, to suggest a probable method of successful treatment of cattle attacked by it, and the means to be adopted to check its progress.

When, however, the orders of Government to this effect were received, (and there was no delay whatever in issuing this order) the disease was on the decline, not however before it had committed extensive ravages in the dairies and farm-yards in the Suburbs of Calcutta.

We purpose, for the sake of clearness, to speak of this disease as the "Calcutta Epizootic of 1864," believing this term Epizootic to be more correct, and to convey a more definite meaning than the term "Murrain" or Cattle Plague; the word "Epizootic" having precisely the same technical signification in veterinary medicine and pathology, that "Epidemic" has in human.

The earliest cases of the "Calcutta Epizootic" that appeared in the neighbourhood, and were brought under treatment, occurred on the 2nd January, or prior to the opening of the Exhibition. There is little doubt but that the disease existed to a considerable extent for some time even antecedent to this; indeed, it is difficult to define a period for its first appearance in Calcutta. It will be shewn presently that a disease very similar, if not identical, broke out in Entally, in the Suburbs of Calcutta, in 1862, and since then occasional or sporadic cases have been observed. The opinion has been entertained by many that the disease originated amongst the cattle exhibited at Belvidere; but such was, as we have just shewn, not the case. It existed for some time previous to the holding of the Exhibition. There is ample proof, however, that many healthy cattle contracted the disease there, and carrying it to their homesteads infected others. Mr. Rutherford, who was the first to recognize the existence of the Epizootic, was early impressed with the idea that he was dealing with a disease hitherto unrecognized in this neighbourhood, by either cattle proprietors or by his profession, and it was not long before he was made fully aware of its intractable, almost incurable, nature, and of its infectious character. As has been observed, it first attacked one, and then many of the cattle exhibited, and towards the close of the Exhibition the Epizootic appears to have reached its height From this time it gradually died out, and when the subject was made one of special investigation, the disease had not only materially lessened, but the cases that were brought in, were found to be less severe and more amenable to treatment. By the end of April, the Epizootic had disappeared as such altogether, although sporadic cases have since been brought under notice and treatment, as we are informed by Mr. Greenhill; but as an Epizootic from this time, the end of April, the disease had died out. We may, therefore, define the time during which the disease existed, as an Epizootic, from January to April inclusive. The havoc this Epizootic committed during the period under review was great and serious; it spared but few; no condition, nor age, nor sex, was a protection: indeed the best fed and cared for, and in the highest condition, were at least as liable to be attacked, as cattle in poorer condition and indifferently housed and fed; and all equally succumbed. The disease, as a rule, made a clean sweep of all the cattle in a yard were it had found ingress. We may in elucidation mention the fatal result to the large and valuable head of cattle belonging to Mr. Floyd of Alipore, he lost all. Mr. Stalkartt of Howrah lost all his, and many others who had for years given the subject of the improvement of the breed of cattle in Bengal much consideration, and had expended much time and money on this object, saw their work of years demolished in a few weeks. It is not, we regret, in our power to give any correct or reliable statistics shewing the number of cattle attacked by this Epizootic, but the result of treatment of those which were bought in was most alarming and discouraging, probably not less than 90 per cent. died! (Rutherford.)

We now proceed to give the symptoms of this Epizootic, for which we are indebted to Mr. R. Rutherford, who made careful notes of the cases that were brought under his observation and treatment, and who has most liberally placed his notes at our disposal. Mr Greenhill also lent us valuable assistance whilst conducting our enquiries, and his observations corroborate those made by Mr. Rutherfod. It is to be remembered that these notes were written some fifteen months since, and when we compare them with the symptoms given of the Epizootic now raging in England, their closeness and similarity to these is remarkable. Mr. Rutherford describes the symptoms thus: "The disease is ushered in, in all cases with fever of a remittent character, but it is only in a few cases that the shivering and sweating is observed; the skin is hot and dry, or otherwise of a clammy feel; ears hot, and pulsation of their arteries very distinct; extremities hot and cold alternately; breathing accelerated and oppressed; catching of the flanks, and frequent twitchings of the muscles of the flank. Dulness and loss of spirits is an early symptom, and a strong disinclination to move or be moved about; the horns are hotter than usual, more so near their base; eyes dull and expressive of pain of a dull character: conjunctival lining red; and towards the inner canthus the membrane shews several ecchymosed spots; gradually the eyes become duller and more dusky in hue, a discharge of tears is constant, and the animal experiences great annoyance from the flies buzzing about the eyes; the muzzle is usually dry, hot and glazed, or otherwise a few drops of water are exuded, which however do not run into each other and make the muzzle moist, but remain isolated. There is early a watery discharge from both nostrils, which gradually assumes a muco-purulent character. From the mouth you early observe a dribbling of saliva of sticky nature and mixed with air, and of a disagreeable fetor; the mouth is very hot and breath early of a most disagreeable fetor; this is a most important symptom and will almost distinguish the disease from any other. The tongue towards its base is slightly swollen and coated with mucus and saliva. I have observed no soreness of the mouth except in one case, and that was confined to the gum of the incisor teeth. At times, however, slight ulcerated spots are easily observed on the Schneiderian membrane; they are small and superficial, irregular edged and of a yellow tinge, owing apparently to a covering of lymph on their surfaces. The colour of the Schneiderian membrane is early of a deep red hue, gradually becoming more so, and in many cases evidently embarrasses the breathing. The air expired through the nostrils is also of a fetid odour, as also is the discharge; cough, although present, is not, in my opinion, pathognomenic of the disease, as I have only noticed it two or three times; this I think is owing to the intense inflammation of the fauces and larynx; the pain of coughing would be fearful and the animal avoids it. Amongst the earliest symptoms is the animal's total refusal of food and drink: water even cannot be swallowed, and these forced upon the brute are swallowed with great pain and difficulty; this is a distinguishing symptom and one of great value taken in conjunction with the dribbling of fetid saliva from the mouth. At first the urine is only slightly changed in colour, in some instances not at all, but in all cases it latterly becomes very much diminished in quantity, of a high colour and strong smell. The action of the bowels at first natural, rapidly becomes deranged; the discharges are of a darker colour, incline to a blackish green hue, rank and very offensive odour; but as yet there is no positive diarrhœa. At any time, however, from this, diarrhœa may supervene; the fœces become much thinner, are discharged frequently and with violence, mixed with mucus and air, and in most cases shortly afterwards with blood. By this time, however, the fever has generally altered in character; it has assumed a low typhoid form; the animal is thoroughly prostrate, capable of no exertion or exercise of nervous energy; the former symptoms are aggravated, the skin becomes cooler and more clammy, and the ears of irregular heat; remission of the fever takes place, sometimes once a day, in other cases in two days. This also is observable of the purging in a few cases; the breathing becomes short and quick, and pulse quick and tremulous; expression of face is that of dull pain and congestion about the head: the flies swarm about the eyes, mouth, and nostrils, and as appeared in my *post-mortem* examinations, readily deposit their ova on the inner edge of eyelid and nostril. In milk cows the secretion is early diminished, gradually becoming less, but rarely entirely suspended; it is, however, of inferior quality and slightly altered in colour, as if mixed with the serum of the blood. In some cases symptoms of abdominal pain occur, getting up and lying down at times, boring the head into flanks and cold sweats; in others there is strong evidence of the lungs being involved: the breathing is catching and abdominal, and auscultation gives an increased harsh sound over the region of the larger Bronchiæ. Towards the lower part of the Trachea and bifurcation of the tube the mucus râle is very distinct. Tympanitis of the first stomach is a common symptom, but never to a great extent, and is owing to the suspension of rumination which latter took place at the commencement of the disease; the food in the stomach ferments and decomposes, giving off gas in the process. If tapped the gas still continues to form, unless some strong stimulant is passed in through the Cannula. Tenesmus is now present, and the motions are frequently mixed with blood; in other cases the discharges are like dirty water, and come away with sudden violence, discharged almost involuntarily. By this time, the animal has become extremely offensive, her motions and breath taint the surrounding atmosphere to a nauseating degree, and in the majority of cases death now rapidly ensues from exhaustion and depraved blood."

Such are the symptoms noticed and detailed by Mr. Rutherford; he has condensed them into the following as "diagnostic symptoms."

1st. - Total refusal of drinks, also of food, and this from the earliest stage of the complaint.

2nd.—Disagreeable fetid breath.

3rd.—The finger placed backwards on the tongue can detect the slightest fetor; generally this is unnecessary, as the saliva which dribbles from the mouth affords ample evidence of the fact.

4th.—No eruption on teats or soreness of feet.

5th.—Diarrhœa of a fetid character early setting in.

6th.—Scanty high coloured urine.

7th.—Fever of a remittent form.

8th.—Disease averaging from two to eleven days; four days averaged in fatal cases; convalescence protracted to many weeks.

9th.—Inflammation of Pharynx and base of tongue

10th.—Tenesmus and Dysentery, at times choleraic evacuations.

These symptoms, thus carefully noted by Mr. Rutherford, tally with the observations made by Mr. Greenhill, V. S. and by many non-professional observers who watched the progress and symptoms of the disease with minute attention. Amongst these Mr. Floyd has written a most clear and able description of the Epizootic, as it first attacked and made its way through his farm-yeard. This account is so full of interest that we venture to give it *in extenso.* Mr. Floyed writes: "I sent several cows to the late Exhibition at Alipore, and they were all in good health when they left my farm-yeard. A day or two before the prizes were awarded, I observed that my best cow was failing in milk and would not eat all the food that was given to her. I attributed it to her being in a strange place. The following day she appeared afraid and anxious to leave the stall, quite regardless of her calf. In the afternoon an Up-country cow died in an adjoining stall, and in the neighbouring stalls several belonging to Mr. Apcar and others, were reported to have refused their food. A few days prior to this, one of two cows that had come from Chowringhee sickened and died. The death of the Up-country cow above alluded to, induced me to suppose that something serious was about to happen, and I obtained permission to remove my cows. The change, however, did my cow no good, she was still fretful, and in about a couple of days became very dull; the ears drooped, saliva ran from the mouth, and eyes became inflamed. I then sent her away from the farm and had her treated by natives; they said she had the "Matha:" whatever it was, her calf took the disease and died first. The cow being a strong animal lingered for about eight days; Diarrhœa came on and she died. For a week or, longer everything went on well, and I fancied that I had acted wisely in having sent the diseased cow out of the farm. Another valuable cow, however, fell sick, and in a few weeks every cow and calf belonging to me fell a victim to the disease.

I tried everything that man could devise, separating the healthy from the sick, keeping them perfectly clean, fumigating their houses, not sparing lime; giving those too ill to eat gram &c., arrowroot, suttoo, and boiled rice recommended by Natives. During the first stage I tried purgatives with some, but in none could I perceive the slightest improvement for a single day; the symptoms were the same in every case, only some cows died in five days, others in eight or ten. The coat of my cows became rough, but there were no pustules visible, the mouth and throat appeared inflamed, and the eyes became mattery after the redness subsided, which was generally in about three days.

I would here remark that I placed three healthy cows in my stable in the hope of saving them; they did very well for some time, but even there the disease attacked them; they were removed without loss of time. A fortnight after however my horse got sick, suffered with the same symptoms and died in less than eight days. I got the stall thoroughly repaired, the floor renewed, and all the wood work painted, and all the time it remained unoccupied (nearly two months) I kept it well aired and smoked; not apprehending infection, I brought a healthy young mare and kept her in the stall for about twenty days, when she too sickened in the same way and died. The sufferings of the horses were greater than those of the cows; the throat became affected much sooner.

In one thatched shed, with a kutcha (mud) floor, four calves became diseased and died. I then placed an old sow in it, and kept her there for about three months; she never got ill, and when I removed her I had the shed well cleaned and covered with clay and cow dung, and kept two horses in it up to the day of the late Cyclone, (October 5, 1864) when the shed was blown down: the horses were not sick, nor sorry for a single day." Mr. Floyd proceeds to recommend, on the authority of a letter to the Illustrated London News of some time since, Turpentine, and states that the remedy was successfully tried by his neighbour, Mr. Pritchard; to this we shall revert when we notice the mode of treatment of the disease. He then observes: "The disease from its first stage attracts myriads of flies, which prove very distressing to cows. When Mr. Pritchard's cow got the turpentine and linseed oil, the total absence of flies was remarkable." Some years ago the disease prevailed in Russia, and lasted for 5 years. Some parts of Australia have been known to suffer from it Natives of the N. W. Provinces say, that whenever it has appeared, it has remained for 4 or 5 years, breaking out between November and January, carrying off horses and other animals, as well as cows." This highly interesting account tallies very closely with the symptoms given by Mr. Rutherford, and it is of importance to note that Mr. Floyd's description is that of a non-professional person, who described exactly what he saw without consulting a veterinary surgeon. Further, both these reports were made during last year and long before the English "Cattle Plague" had made its appearance.

It is worthy of remark here that the cattle treated by Messrs. Greenhill and Rutherford were invariably brought to the extensive stables over which they preside, were kept in stalls and boxes adjoining horses, yet the disease was in no instance communicated to horses, and even with Mr. Floyd's cases before us we cannot but record our opinion that the disease is not communicable to horses.

Our own observations, and those made by others, who watched the progress of the Epizootic are completely confirmatory of the foregoing.

In 1862 Mr. Ladd, who has long been an enthusiast in cattle breeding, had a fine young cow attacked at his farm at Entally, in the Suburbs; his description of the disease his cow sufferred from, corresponds closely with the above specified symptoms. She was treated by a highly intelligent Veterinary Surgeon, Mr. Bretherton, who pronounced the disease to be an uncommon one, and to be essentially a "blood disease." Out of a total of 9 head of cattle 7 were attacked and died; but it does not appear that the disease spread at this time. Mr. Rutherford, however, states that he believes he has met with cases occasionally both in Calcutta and on the other side of the river at Seebpore,* but that these cases were of a sporadic character and did not spread. Mr. Ladd recognized the disease at the Exhibition on its first appearence as the same his cattle had been affected with two years previously, and warned Mr. Floyd of its infectious nature, and advised him to remove his cattle at once; but the warning came too late; these circumstances are of practical importance, as they go far to prove that the Calcutta Epizootic of 1864 was really not, as we generally believed, a new disease, although we are not in a position to assert that it had been previously known as an Epizootic.

Having thus fully given the symptoms characterizing the Calcutta Epizootic of 1864, we proceed to remark upon other Epizootics which have been rife of late years in different portions of this country; and we shall be led to the conclusion from the information which has been submitted by the Chief Officers of extensive districts, that a disease similar to, probably identical to that we have described, has been long known under other denominations in India, and we shall endeavour to show that at least two distinct Epizootics are, and have been of frequent occurrence. To quote extensively from the reports which have been submitted would be to lengthen this paper to an inconvenient and unnecessary extent. The correspondence has already been published in the Supplement to the Calcutta Gazette of March 12th, 1864. We propose, therefore, to extract only briefly from these letters premising that there is a remarkable resemblance in all the descriptions given so much so that we are compelled to believe that similar Epizootics have been recognized in various Districts and appear to be equally fatal in all. There are, doubtless, many other and different Epizootics which may have been confounded with those described; but we have, we believe, ample evidence to lead to the conclusion that at least two distinct, highly fatal and infectious, Epizootics have been described in these reports with considerable accuracy. One of these is the same as the Calcutta Epizootic of 1864. The other is of a different character, but also well known in Calcutta. The districts from which reports have been submitted, comprise a large portion of the Madras Presidency and nearly all of Bengal, *viz.*, Burdwan, Nuddea, Rajshahye, Patna, Chittagong, Bhaugulpore, Dacca, Cuttack, Assam, Chota Nagpore, Cachar, Darjeeling, and were the enquiry extended to the N. W. Provinces and the Punjab, it is believed that reports similar to those submitted by the Bengal Officers would be furnished, and Mr. Floyd's statement founded upon information given him by Natives belonging to the North-West, that a similar disease has been for years known there, would receive confirmation.

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* Of 13 head of cattle 13 were attacked and all died.

When it is borne in mind that the various reports above alluded to are each an analysis of many reports furnished by the Magistrates attached to the several Districts in the extensive Divisions mentioned, we should *a priori* expect to find a great variety of description and not a little actual inaccuracy, such however is not the case, and we believe that the general similarity of these reports is owing to the fact that the Natives, as a rule, describe all Epizootics, or Cattle Plagues, as Small-pox,—Gheotee or Bussunt; and this is particularly exemplified in Mr. Floyd's memorandum; he says, speaking of his cow, that he had handed over to the Natives for treatment; "they said she had the Matha," Small-pox: further, we have known a disease attacking numerous heads of cattle in Calcutta, and carrying off large numbers, described as Bussunt or Ghootee or Small-pox. Under this name it was for years known as existing amongst the cattle belonging to the municipality of this city, and it was only in 1861, when a veterinary surgeon was, on our recommendation, appointed to the care of the municipal cattle, that the disease was accurately described and recognized, not as a Variola or Small-pox, but as a most alarming, fatal and highly infectious Epizootic, *viz* the "Eczema Epizootica" or Apthous Epizootic, or "foot and mouth disease" of Veterinary Pathologists It is this Epizootic which has been so universally described, and in terms of extraordinary similarity as the disease which has reckoned its victims by tens of thousands throughout India, and with which the Epizootic which appeared in Calcutta and elsewhere has been, we believe, not unfrequently mixed up and confounded; the two diseases have many features in common, but they are entirely different in their nature. The "Eczema Epizootic," the animal is hot, listless, exhibits all the symptoms of fever, and is *lame:* the feet high up in the cleft of the hoof are early affected; vesicles are frequently observed on various parts of the body, especially between the thighs; the mouth becomes affected, dysentery supervenes, and if allowed to arrive at this advanced stage, the majority die; but the disease if early recognized is very amenable to treatment. From our own experience we believe it selects the ill-fed, over-worked, and weakened constitution Comparing these symptoms with those given of Calcutta Epizootic of 1864, it cannot be a matter of surprise that the two diseases have been confounded.

Captain Nelson describes the Cattle Disease in the Madras Presidency thus: "The disease in question, which is now reducing the heads by half, shews itself first in a refusal of food; the ears droop; the eyes run water; purging commences which in a few days becomes a bloody-flux; and the whole body is covered with pustules: the animal dies between the fifth and tenth days, when with a piece of cloth you may sweep the body completely free of hair and cuticle, it comes off as it had been scaled." This description tallies completely in certain well marked features with the symtoms given of the Calcutta Epizootic, but it clearly and indisputably, we consider, establishes the difference, in that the animal is "covered with pustules," &c. Captain Nelson is describing the "Epizootic Eczema," or, as it is commonly called in England the "foot and mouth disease," and we venture, without casting the least disparagement on Captain Nelson's observations, to hint that, had the Epizootic he had so well described been watched by a veterinary surgeon, we should have learnt, in addition, that the feet were early affected, even though actual lameness had not resulted.

Captain Campbell, Deputy Commissioner of Nowgong, describes an Epizootic in his District thus: "On referring to the records of this Office, I find that in the year 1853, from January to June, no less than 21, 625 head of cattle died. During the above period Cholera was raging to a great extent, and carried off 9,060 persons; consequently the Natives, I asked about it, say it was the same disease that carried off the cattle. The symptoms appear to have been a *swelling of the tongue*, which portruded from the mouth, great purging, and the animal was generally dead in two days. I cannot discover that there was any resemblance to Small-pox, as appears to be the case at Madras." Here we are evidently dealing with a disease distinct from that described by Captain Nelson; and we are of opinion that it was of the nature of the Calcutta Epizootic.

From Jessore, a District which suffers much yearly from extensive mortality of Cattle, we have Mr Oliphant writing as follows:—"It (the Cattle Disease) is known by the name "Mardrishtee" which means the look of mother "Shetala," the Goddess of Small-pox; and the first symptoms which show themselves, are a disinclination to eat food, a blood colouring of the urine, and the breaking out of pustules on the body; and these are followed by others mentioned by Captain Nelson." Mr. Oliphant proceeds to say that the disease is considered fatal, and mentions the means used for effecting a cure or arresting its progress. This disease is, we feel persuaded, "the Eczema Epizootica." Mr. Oliphant, however, goes on with his investigation and says—"There is, however, another disease in this part of the country very similar to the above, but much more common, called 'Puschima,' probably because it was supposed to have travelled from the West, and a large number of cattle have fallen victims to this disease within the last few years. The symptoms are, for the most part, the same as in the first mentioned disease, with the exception *that no pustules are visible on the body. The Natives, however, appear to think that the two diseases are distinct*, and that what Cholera is to man, Puschima is to the cattle; they look upon it as fatal, and do not appear to try any remedy or cure." Mr. Oliphant states that owing, as he is informed, to the ravages of this latter Epizootic chiefly, the diminution of cattle in his District, Jessore, is such that the price has risen "ten times higher than it was formerly." In the District of Burdwan, again two distinct diseases are described. The one as Ghootee or small-pox, the other is there also, called "Puschima," which is more fatal than the former. The immediate symptoms are loss of appetite, swelling of the glands of the throat, difficulty in breathing, enlargement of the head, and occasionally of the stomach also." It is scarcely possible to have a more independent convincing evidence than the above, that the two distinct Epizootic, we have named, have been for years raging, in one and the same District or locality, and it we consider establishes our view that the two Epizootics, *viz.*, the Eczema and the Calcutta Epizootic, have extensively existed, and not improbably contemporaneously in the same localities, and that they have been in some instances confounded. The reports before us are replete with similar evidence ; but we must be content with one further extract to add still greater force to this opinion. Mr. Jervoise Grey, writing from Sarun, describes a disease which is there called "Seetla" or "Matha" or "Chenchuck," and of which the symptoms are similar to those of the Cattle Murrain prevailing in the Madras Presidency, namely, refusal of food, running from the mouth, eyes and nostrils, and purging, *but pustules are said to appear only slightly and occasionally*. This, we are of opinion, is the Calcutta disease, and not the Eczema "Epizootica." Mr. Holm, a gentleman of great experience in Rungpore, alludes to a disease amongst cattle known there as "Golu-Har," the chief symptom of which is "ulcerated sore throat," for which no successful treatment is known. He also describes the Bussunt or Small-pox and "Cholera."

Sufficient has, we think, been advanced to prove the existence, very extensively throughout India, of two distinct and very fatal Epizootics ; the one, we believe, to be identical with the "Eczema Epizootica," or "Apthous Epizootic," of "foot and mouth disease" of England. The other is identical with the Calcutta Epizootic of 1864, and which we have advanced evidence to shew was no new disease but had hitherto been either confounded with other diseases, or not taken any very special notice of. We have hitherto spoken of this Epizootic as that of Calcutta of 1864, without attempting to classify it amongst recognized cattle diseases. We have little doubt, however, that this disease is the one known in Europe as the "Rinderpest," the Epizootic which for so many years past has devastated Central Europe, and from "its home" the steppes of Russia has again forced a footing in England and is at this moment working out its deadly course amongst the cattle of the metropolis, and by the last received accounts is spreading through the counties of England ; a disease which in the opinion of those best qualified to judge, both in England and France, was restricted to a circle, large indeed, but still restricted, and could not possibly extend itself beyond those precincts. If our opinion be correct, it will be seen that this deadly cattle scourge has been making rapid strides in this an eastward direction, and that all the regulations which have been on the Continent of Europe so rigidly enforced, the Military 'cordons' which were to have prevented any diseased cattle from leaving a farm or a locality in which the disease had shewn itself, and the strict supervision exercised at ports, both of export and import, have apparently proved futile in checking the spread of this fatal Epizootic in a westwardly direction. Accepting the opinion expressed by Professor Symonds and other leading veterinary authorities, both in England and on the Continent, that the steppes of Russia is the home of this disease, and that it has spread from thence by infection, and that by severe sanitary prohibitions its progress might be limited; it is a highly interesting and important fact to advance that this same disease has travelled eastward, and as it has been unchecked by any sanitary restrictions, its progress has been, perhaps, proportionally more rapid in an eastwardly and unguarded and unprotected direction than it has been westwardly, where science, backed by arbitrary and even despotic Government aid, has been called in to check its march, but with, as it now appears, only partial success; it was checked only not turned back; it is raging in England with a violence equal to any it has exhibited in India or elsewhere, and threatens to bring distress and disease to thousands. It, however, must be borne in mind that, although a universally admitted contagious or infectious disease, it is not at present believed to owe its existence to infection alone, it is held to be a true Epizootic engendered by some malarious, or, as yet unknown, Epizootic influence, and in all probability its cause will be found to be similar to all other Epizootics, and it will exhaust itself or die out. It would occupy too much space to transcribe the symptoms, &c. given by Professor Simonds and others of the Epizootic of Central Europe and Russia, and which is known on the Continent as the Rinderpest, which name Professor Simonds proposes to designate it by in England. We content ourselves by asserting that those symptoms so closely resemble the symptoms observed here of the disease in 1864, that little doubt can be entertained as to the identity of the two diseases: but should any person wish to pursue this subject more minutely we would refer him to Professor Simonds' evidence given before a Parliamentary "Committee on contagious diseases bill" and his "report on the cattle plague:" and a paper by Mr. Renault, Director of Alford, read before the Central Society of Agriculture of France, all of which are contained in the "Veterinarian" for 1857-58 and

1859, and in an article headed "cattle plague" in the Veterinarian, July 1st, 1857, will be found a very full description of the Rinderpest, which we had transcribed, but now exclude from this paper, as we fear extending it to too great length. These articles are well worthy the perusal of those interested in this enquiry, and we believe that the symptoms described in the "Veterinarian" proves the identity of the two diseases, the "Rinderpest" and the Calcutta Epizootic of 1864.

It has been remarked in England, by Professors Simonds, Gamgee and others, that the present English Epizootic is not only the "Rinderpest," but that it was known in England in 1745, and was ruinously destructive throughout the country. Existing for several years, (12) in spite of the most stringent sanitary laws enacted and rigidly enforced with the view of checking its spread, it was stated to have been then imported from Holland by two diseased calves: it is now reported to have been brought by foreign cattle into Islington market. The general opinion is, that it is an imported and infectious disease, but on the other hand there are many who insist upon its origination within the country, and is not an imported disease, and this question is now being very warmly discussed. The descriptions given of the symptoms are however, very similar, and admit of little or no misunderstanding or doubt as to the nature of the disease when it shows itself. We select amongst numerous reported symptoms, furnished by men of eminence, the following which are published by order of the Privy Council. The identity of the symptoms, with those recorded by Mr. Rutherford in this paper, are remarkable, and again confirm our opinion of the nature of the disease which we observed here in 1864.

The following is copied from the *Evening Mail* of August 7th, 1865.

"Description of the symptoms of the disease before referred to."

"Variations in the earlest indications of the disease will be manifested; these depending somewhat on the severity of the attack, but more especially on the circumstance as to whether the digestive or respiratory system is the chief focus of the malady.

As soon as the affection declares itself, the animal ceases to take any kind of food, and in most cases even refuses water; rumination is suspended, and the animal stands with its head drooping and its ears drawn back. If made to move, it shows great prostration of strength, and frequently staggers as if about to fall. The skin is hot in places, and often remarkably so between the limbs, the hind ones in particular. An exudation early takes place from these parts, and is succeeded by cracks and sores. The hair is staring, especially along the upper part of the neck, shoulders, and back. The extremities are cold, even at the commencement of the disease, and in a later stage of the increased heat of the surface of the body gives place to a remarkable coldness, especially along the course of the spine.

Tears trickle from the eyes, which are red and expressive of suffering, and a watery discharge flows early from the nostrils. There is a continuous increase of these secretions, which become more or less purulent in the advanced state of the malady The mouth is hot, red, and "inflamed," often presenting here and there raw-looking spots, especially on the inner side of the lips and along the roof. The breath is fœtid. The respiration is increased, and generally accompanied with a moan in the advanced stages. A slight cough is also present in some instances. The pulse is quick and weak and scarcely to be felt, excepting at the heart, even at the commencement of the disease.

The bowels are sometimes torpid at the outest, but Diarrhœa leading to Dysentery mostly follows; the evacuations being slimy, liquid, and of a dirty yellow colour, occasionally tinged with blood. Tenesmus is likewise present as a rule. Slight tremors of the muscles of the shoulders and thighs are to be observed in some cases, and so also is an emphysematous condition of the skin along the upper part of the back. In milch cows the secretion of milk is quickly arrested, and remarkable diminution in the quantity taking place as one of the early indications of the attack. As the disease advances towards a fatal termination the prostration of the vital powers becomes more marked; the breathing short, quick, and more painful, the alvine evacuations more fœtid and more slimy, and the surface of the body deathly cold. The animal will sometimes sink as early as twelve hours from the commencement of the attack; but in many cases the disease will be protracted to the fifth or sixth, and occasionally to the eighth or ninth day.

The period of incubation of the disease is found to vary, the majority of animals sickening on the tenth day after exposure to the infection but some have been attacked on the seventh day."

Nothing can be more convincing than the above description, tallying almost verbatim with those we have given of the symptoms of the Calcutta Epizootic. The diseases are, we consider, one and the same. Mr. Rutherford's memorandum was written fifteeen months since: Mr. Floyd's ten months since; the symptoms just copied from the *Evening Mail* not two months ago, and Mr. Greenhill, who has paid much attention to the disease and has treated a vast number of cases, gives a similar description.

It would be highly interesting to trace the roads by which this Epizootic has spread itself over the old world, and doubtless ere long we shall ransack its origin and spread with the same accuracy as the origin and spread of Epidemic Cholera has been investigated and made known. It is worthy of remark that the cattle disease which devastated Egypt, broke out in that country a few weeks after its disappearance here, and we are informed by the *Times* that the Epizootic carried off no less than 700,000 head of cattle.—(*Evening Mail*, August 7.)

Mr. Rutherford made *post-mortem* examinations of a great number—with one or two exceptions—all of his cases, and he has kindly placed his notes at our disposal; they will be read with interest by those who are prosecuting the subject. He remarks: "The principal changes were confined to the mucus membrane of the alimentary tract. *The tongue* in all cases is swollen, particularly towards its base, and throughout its whole substance, I observed effusion into and discoloration of the muscular substance. The superior investing membrane in all cases was separated from the substance of the tongue by effusion, was very much thickened and was covered with a thick viscid fetid secretion or products of inflamation, apparently *muco-purulent.* The mucus membrane of the *pharynx* was similarly inflamed, and presented the same characters, being thickened and covered with a greyish exudation. In all cases, these appearances extended into the nasal passages, producing throughout appearances somewhat modified towards the nostrils. In some cases small abrasions were observed on the Schneiderian membrane. I noted the fact of immense quantities of small bodies resembling the ova of flies covering the mucous membrane of the posterior nares and pharynx. In most cases the inflammatory signs were traceable into the larynx, and thence more or less modified into the *trachea*, seldom further. From the *pharynx* the appearances above noted were to be easily traced along the *œsophagus* into the first and second stomachs and into the third stomach; here, in many cases, the food was found caked as hard as in the disease known at home as 'Fardel bound.' This appearance is owing to the non-swallowing of fluids, the arrest of secretion and functions of the third stomach. In all cases the fourth or true stomach was very seriously affected; it was generally empty, with the exception of a little variously coloured liquid; the mucus coat red, in patches dark red, swollen and thickened and very easily detached from the muscular coat. In many cases bile was plentiful in the stomach, as also in the *duodenum*, which intestine with the jejunum and ileum was affected similarly as, but more intensely than the stomach; ulcerated patches were frequently met with, but never any deep ulcers, but rather rough, irregular edged depressions on the mucus membrane, with dark red circumferences. The *large intestines* were generally empty and but slightly affected, with the exception of the *rectum*, which generally exhibited signs of great irritation. The *liver* was in all cases highly congested, and even enlarged. The kidneys and other viscera were in no wise affected. The blood was in a grumous state."

Mr. Greenhill also made *post-mortem* examinations of very numerous cases which came under his observation and treatment, and he gives the following as the chief and most important of the diseased appearances noted. "The back part of the tongue and throat inflamed; mucus membrane of the larynx and air passages inflamed; heart soft in texture; liver congested, and the whole of the fourth stomach greatly inflamed with patches of a dark purple hue, and abrasions of the mucus membrane all along the alimentary canal. The rectum for about three feet from the anus inflamed and studded with black patches. The large intestines healthy; kidneys healthy."

These *post-mortem* appearances correspond in many respects, and indeed, generally, with those met with by Professor Simonds, and described in his evidence before the Parliamentary Committee before alluded to. They indicate a typhoid or "enteric" condition and bear out to a very considerable extent the idea that has been advanced that this disease is a "Typhoid Fever."

To those who have read the reports and evidence of Professor Simonds published in the "Veterinarian on the rinderpest," also the reports furnished by the Commissioners and Magistrates throughout Bengal of the cattle diseases, observed in their several Districts especially noticed in this paper, our own remarks regarding the Calcutta Epizootic of 1864, and the recent accounts of the disease now raging in England, it will not be a matter of surprise to learn our complete inability to recommend with confidence any one particular treatment as likely to be generally attended with successful results. We have already recorded the almost universal fatality amongst all the cattle submitted to treatment. At one period every case died, but towards the decline of the Epizootic many cases did well. Some of these exhibited the disease in a marked form, but by great care and attention made a slow, tedious, but at length complete recovery; and from these we may be permitted to recommend a course of treatment, which in mild cases will be found to be generally successful, and certainly worthy of trial in even the most hopeless. We would venture to hope also, that as the nature of the disease is more minutely investigated, and its pathology understood, a corresponding advance will be made in its treatment, and this, we feel persuaded, will ere long be the result of the general discussion and deep interest the disease is at present commanding in England.

It would be of no practical utility our relating the modes of treatment, which have from time to time and in different places been adopted by the Natives of this country. The result of such treatments has been generally utterly inefficacious, based, as they frequently are, upon superstition. "Poojahs," with some, rice grown at Juggernauth, raw fish, and the dried tongues of tigers and leopards with others, have had, and continue to remain, on trial. More rational and consistent measures have, however, been in many instances adopted; such as the removal of infected cattle, cleanliness, fumigating infected cow sheds, and the giving of nutritious nonstimulating food, and fresh wholesome grass, also stimulating drugs; but the same story is told by all; treatment is inefficacious, and to quote any mode of treatment, which is allowed to be of little value, would be simply filling this paper with certainly many curiosities of Native and even European treatment of diseased cattle, but can be of no practical utility.

To give, however, the treatment adopted, in some cases with success, will, we consider, be of much practical assistance, not to that portion of the public only who are deeply interested in this important subject, but also to members of the veterinary profession, both in India and in England, who have hitherto considered the disease almost, if not wholly, incurable. We might quote many cases of successful treatment, but the following will exemplify sufficiently the treatment which we would advocate. The two cases subjoined, were treated by Mr. Greenhill. We watched these and we can safely affirm that they were well marked and almost hopeless cases of the disease.

Case I., by Mr. Greenhill.—"April 10th, 1864, called to see a cow of Mr. J. Stalkartt of Howrah. The cow was in an off place, having been separated from the others by the owner. I found the cow with a young calf by her side about six weeks old; the cow's skin was hot and dry, coat staring, breathing increased, mouth and breath fetid; a quantity of saliva dropping from the mouth; the saliva was of a thick sticky character; eyes rather dull. Ordered the cow and calf to the hospital. Purging had not commenced when I first saw the cow. Gave spirit of nitric ether six ounce, aromatic spirit of ammonia two drachms. On the 11th cow worse; eyes sunk in her head, breathing increased, purging greatly, black in colour and fetid, with slime coming after the fœcal matter had passed, lying down a good deal, the head portruded straight; gave opium one drachm, camphor one drachm, with gruel; towards night the cow seemed a little better, but took not the slightest notice of her calf; repeated the medicine. On 12th purging less, cow easier, breath fetid; gave spirit nitric ether six ounce, gentian four drachms, aromatic spirit of ammonia two drachms, in gruel. Calf taken the same as the mother; with great trouble we gave it food. Night cow better; gave gentian and ginger half ounce each, with one drachm camphor in gruel: gave calf gruel: calf unless roused would lay in one place. On the 13th, cow this morning passing large quantities of blood, but the fœcal matter better in colour, and the fetid smell not so great: calf worse; gave cow two bottles of beer with two drachms of gentian and two drachms of ginger. At 2 P. M., cow for first time notices calf and inclines to pick green grass: calf worse. Night cow easier; dung of better colour, and less purging; gave gruel with beer. On the 14th, cow better; calf dead; dung brighter in colour; purging stopped, no more blood passed; dull about the eyes; gave beer with gruel: 1 P. M., gave beer gruel; 6 P. M., cow breathing hard, lung affected, cough dry; blistered sides with croton oil and turpentine; gave opii one drachm, Tartar emetic two drachms. On the 15th, dressed blisters; gave gruel; breathing easier, and brighter about the eyes, purging setting in again; gave camphor and gentian each two drachms, and opium one drachm in gruel: 1 P. M., gave gruel again; cow appeared easier; 6 P. M., purging less, gave gruel. On 16th, cow better and brighter, purging stopped, breathing less; dressed sides, gave gruel; cow picks a little Australian hay for the first time. On 17th, cow better; dung bright in colour, but still fetid; gave gruel; eats a little dry hay and green grass. The cow from this time had no bad symptoms, and was discharged cured.

Case II.—A white bullock entered in April 11th. Coat staring, large discharge from mouth and nose, breathing quick and fetid, dung of a blackish colour; gave epsom salts one ℔. powder of capsicum one ounce, turpentine four ounces, and gruel. On 12th bullock purged smell fetid, dull in coat; breathing slightly decreased; flow of saliva from mouth and discharge from nose less; gave camphor one drachm, spirit nitric ether six ounces, aromatic spirit of ammonia two drachms: 1 P. M., gave gruel; bullock dull, purging lots of mucus and small quantities of blood, and very fetid: 6 P. M., purging less; bullock dull; gave ginger and gentia of each two drachms, with beer in gruel.

On 13th bowels more healthy, less fetid; eyes brighter, less fever; gave camphor one drachm, nitrate of potass two ounces in beer gruel; 1 P. M, gave gruel; looking better but not feeding: 6 P. M. purging stopped; dung healthy in colour; eats nothing. On 14th bullock better; eyes brighter, breathing little harder; breath less fetid, dung rather hard but healthy, refuses all food; gave beer gruel, lays down with head straight out and groans a little: 1 P. M., gave Tartar emetic two drachm, nitre two ounces, ginger one ounce: 6 P. M., dung healthy in colour but hard; eats nothing; gave epsom salts two ounces, camphor two drachms, powder Capsicum two drachms. On 15th bullock not so well, breathing greatly increased; blistered both sides with croton oil and turpentine; gave Tartar emetic one drachm, nitric two ounces, turpentine two ounces in gruel: 1 P. M, no better, blister upsetting, the animal: 6 P. M., the same; gave gruel. On 16th blisters taken dressed; breathing easier but grunting; bowels well opened but not much purged; a quantity of gas passing off from intestine; gave assafœtida two drachms, powder Capsicum one drachm, camphor one drachm: 1 P. M., easier; gave gruel; looking about; left off grunting: 6 P. M., gave beer gruel. On 17th dressed blisters; bullock looking better; coat smoothed, eyes brighter and fuller, breathing easier, beginning for first time to pick Australian hay. This bullock had no relapse from this time, and with nursing and good feeding completely recovered."

These two cases exemplify the mode of treatment which in Mr. Greenhill's hands has been most successful, and under which he has saved about 50 per cent. Mr. Rutherford has kindly furnished the following summary of his treatment. "Many of the cases in fact all that I admitted into hospital, were put into cool, airy, and thoroughly healthy boxes. My earliest cases were treated, if purging was present, with brandy and tincture opii (laudanum), and on relief being given, this was followed by frequent doses of quinine, brandy, and ammonia in different forms, invariably the purging returned and as invariably sinking and death. At one gentleman's request, and on consideration of his theory of the disease, I opened the skin, made wounds and injected and inserted on sponge, infusion of Quassia; the result was death in the two or three cases experimented on. Different mixtures were applied to the head to keep the flies off; such as those of camphor, turpentine, creasote, and tar water. One case, that of a very fine young Devon Bull, recently imported, and in which the symptoms were peculiarly violent, I had removed to a large airy box, and at once gave a mixture containing the liquor ammonia acetas, and sulphate of magnesia (epsom salts), inserted a seton on each side of the throat and *fixed* his spine, and twice a day applied a strong solution of the nitrate of silver to the base of the tongue and pharynx; he had large quantities of gruel poured down his throat, and stimulants of every description; and also Donovan's solution of arsenic was administered; this medicine was also given in several other cases, and with no satisfactory results. This animal, like all treated at this period, died. In March the disease became more amenable to treatment, as it was also becoming lessened in intensity and in numbers of animals attacked, and from this period cases did recover. One case especially is deserving of notice. A cow, the property of Mr. Cockerell, of Allipore, which had the disease in a well marked form, and from the precautions I adopted for the protection of the other cattle in his homestead, the disease did not extend. The treatment adopted in this case, stimulating the throat both internally and externally daily; administration of large and repeated doses of camphor, sweet spirit of nitric, nitrate of potass or nitre and bhang, and a sufficient quantity of whey to form a drench, and the diet such as she would herself select. I experienced great difficulty in many cases from the total suspension of rumination, and from the affected condition of the third stomach, preventing the free and absolute passage of medicines administered into the system, I had to puncture the rumen in many instances to allow of the escape of gas generated in the decomposition of undigested food; in some cases I passed a tube into the stomach, which allowed the escape of gas as fast as it formed, and by means of which I could pour in stimulants with the view of rousing the rumen into action. I am satisfied from the results of my latter cases, that the most effectual treatment consists in mild laxatives, combined with powerful diffusible stimulants, and particularly counter-irritation by setoning and blistering over the right side, especially towards the false ribs. Setons to the region of the throat I also recommend, and supporting the strength with the best and most nutritious diet in a liquid form. There are many things which will suggest themselves in special cases to the observer."

"In many cases I noticed great relief obtained from sponging the body frequently with vinegar and water. I think there is great difficulty in pointing out a remedy within the means of the poor class of Native cattle owners, unless they confine themselves to preventive measures and to the use of Native purging medicines, combined with aromatics and stimulants."

Mr. Floyd has advocated the employment of turpentine and linseed, and towards the end of the Calcutta Epizootic this treatment was most efficacious where it was tried. It is one that we believe might be more extensively and with much confidence again carried out; it is certainly well worthy of trial, being within the reach of all.

We may give the following as the general indications of treatment to be followed.

I.—Placing the patient in a well ventilated open place, with plenty of clean straw, a dry flooring and scrupulous cleanliness.

II.—Aperients and diffusible stimulants, such as ammonia, ether, camphor, the nitrate of potass and sedatives of which the *Cannabis Indica*, Indian hemp, or Bhang, is perhaps the most valuable, and in this country the most readily commanded.

III.—Counter-irritants, such as turpentine and croton oil embrocations, setons smeared with some stimulants, especially croton oil, as being quick in its action, and these may be applied to the throat and sides of the chest, and especially over the right side and region of the liver.

IV.—Nutritious and even stimulating drenches, gruel made with beer, arrowroot, linseed, and even alcohol or ether, may be mixed occasionally with these drenches, and fresh green fodder or any fresh wholesome food, whenever the animal shews a disposition to pick any.

V.—Sponging the body, especially the head, nares and around the eyes, with cooling washes, such as vinegar and water, which will give a feeling of relief and coolness, and tar water or kerosine may be employed with the view of keeping off the flies which swarm about the diseased animal.

VI.—Supporting the strength in every possible way during convalescence.

To those conversant with the treatment of cattle the above record of cases and indications for treatment of the disease are ample; but to many who have no opportunity of consulting a professional man, or even of obtaining the remedies we have mentioned at once, a few plain directions may be of value, and the ingredients we select are to be procured in almost every bazaar in the country.

In the first stage the following may be given as an aperient drench.

Epsom salts eight ounces, common salt eight ounces, powdered ginger, or pepper, or any aromatic stimulant one to three ounces, mixed up in conjee water, or plain water, and given as a drench. At the same time employ hot water fomentations to the throat, or stronger counter-irritants. If the premonitory symptoms are severe, turpentine six ounces, croton oil one ounce, is a sharp and effectual counter-irritant, and, if procurable, ammonia, the strong liquid may be added, and this rubbed in over the fauces, the chest, the right side over the liver, and along the spine.

The bowels having been acted upon, the next object is to sustain the vital powers and stamina, and sedatives combined with direct stimulants should be given with an unsparing hand. The following will be found useful :—Camphor one ounce, bhang four ounce (any preparation of *Cannibis Indica,* but that met with and sold in the bazaar answers very well), carbonate of ammonia four drachms, brandy one pint, given in a quart of water or when procurable whey.

When the dysenteric symptoms supervene, we can only recommend a steady exhibition of gruel and mucilaginous drinks and stimulants, the so-called astringents kino chalk, &c., have not been found sufficiently successful in their action to warrant our recommending them for trial.

A strong solution of nitrate of silver, a scruple to the ounce, should be applied to the swollen tongue, and as far down the fauces as practicable ; if this is not obtainable, sponging the tongue and fauces with a solution of common salt will be of service.

Where expense is not an object, we would suggest a trial of large doses of quinine and ipecacuanha : the treatment has not been so far as we are aware tried ; but the wonderful influence the latter drug exercises in the human subject in cases of dysentery with hepatic complication, and having here before us a disease which rapidly runs into a deadly dysentery, induces us to suggest a trial of this remedy ; it should be resorted to on the first appearence of dysenteric purging, at the same time we would perseveringly administer stimulants, nutritious drenches, and counter-irritants.

The above comprises all we have to suggest as regards the therapeutic or remedial measures which are likely to be of service ; and admitting a loss of even 90 per cent. of cattle treated, and which is certainly taking the highest possible ratio, and bearing in mind that towards the decline of the Epizootic the cases which came under review were milder and more amenable to treatment, until we find Mr. Greenhill returning a ratio of at least fifty cures per 100 treated, we are justified, we consider, in urging a full trial of the remedial measures we have above given, and in encouraging all who may unfortunately be visited by this disease to patiently and perseveringly carry out the measures we have recommended, and not to be disheartened at even repeated failures. We cannot hold out prospects of great success ; but we believe that many valuable cattle will be saved by attention to the rules we have laid down. We would most certainly not recommend the wholesale slaughtering of cattle which our countrymen in England appear to have so universally, and, as we think, unadvisedly, recommended on the first outbreak of the disease; but which we are glad to find has received a check. We cannot refrain from quoting an extract from one of the many able and practical articles which have appeared in the *London Times*; it gives encouragement and is replete with practical common sense. "What strikes us most is the facility with which farmers and veterinary surgeons abandon themselves to despair so far as regards all hope of successful treatment, and resort to the extreme measure of prohibition and destruction. We could do this, of course, if we were the merest savages, ready to believe a demon had passed over our cattle, and glad to fall back on our yams and plantains: but we are rather better than savages, and we profess to have some power over the diseases of man and beast. It is a very humbling confession that is made by our medical authorities when they tell us to kill at once, for there is nothing else to be done." "All our epidemics from Cholera and Small-pox down to Scarlatina, Measles and the common influenza do much less mischief under some treatments than others." —(See *Evening Mail* of August 21st). Such opinions backed by the knowledge that experience has proved their truth and value, incites us to be up and doing, to use our skill and observation and experience to our utmost ability to combat the dire, but by no means universally fatal disease, which is apparently extending itself over every country of the world.

We have confined our remarks thus far to the purely therapeutic and remedial measures to be enforced in cases of actual disease. There yet remains an even more important branch of the subject to be noticed, *viz.*, the prevention of the disease and the checking it when once it has shown itself in a District, village or homestead. To fully enunciate our views on this most important subject, would carry us far into the recognized and admitted rules of general Hygiene, a science which of late has become generally studied, and which is working out much practical good. Without asserting that fresh air, fresh pure water, absolute cleanliness, wholesome and properly proportioned food, and a regulation of temperature will, combined, form a complete barrier against the attacks of all diseases of a malarious or epizootic nature; we are yet justified in advancing the opinion that these, which may be not incorrectly termed the foundation of Hygiene, will so modify and dilute, if we may be permitted the expression, the epizootic "influence" or poison, that the disease will be of comparatively insignificant importance and danger. In proof of this we adduce the numerous instances which have already been brought to notice of dairies in London having wholly escaped the Epizootic there, owing to their advanced hygienic state, whilst others in their immediate vicinity have been actually swept away. Too great stress cannot therefore be laid on these points as protective against Epizootic disease; but should the disease effect an inroad, the question of how to check its further spread is one of the utmost importance. Prompt and complete separation of the healthy from the affected cattle is to be enforced. To effect this it may be a question as to whether the still healthy cattle should be removed to another and an untainted spot or the diseased animal taken to some place especially set aside for its reception and treatment. The latter will be the more generally feasible plan, but when it is practicable to remove the unaffected cattle, we believe this proceeding the more likely to be successful in checking the disease; this may, however, involve constant change, and thus render its being fully carried out in the great majority of cases impracticable.

In the Mofussil where occasionally almost unlimited space is at command, this course, should, we think, be insisted upon ; early separation, however, is absolutely to be carried out, and not only of the animals themselves, but of every article they have come in contact with that can be removed ; and fixtures must be at once and thoroughly disinfected. Straw, dung, hay, troughs, and such like should be removed, burnt or disinfected; the stall in which the animal stood should not be again used, but thoroughly cleansed out and disinfected: and it would be well were some cheap disinfectant sprinkled over the stalls containing the healthy cattle; night and morning a small quantity of McDougall's disinfecting powder might be dusted lightly over the stalls and sheds. Mr. Murray, in a letter to the *Times*, says he has long adopted this course in his stalls at Manchester with excellent result, and "the cost does not exeed one penny per week per horse." All animals dying should be buried without a moment's delay, not skinned; and no animals should be allowed to approach the burial ground until some time has elapsed since the last interment.

Although in the Epizootic of Calcutta condition appeared to be no protection, yet, as a general rule, we should expect to find the poor, ill-fed and dirty cattle more susceptible, and their physical state should be improved as far as possible.

The question of inoculation has been mooted, and by some the experiment has been strongly urged; we learn that it was tried in 100 cases on the Continent and that all died—(*See* "Veterinarian" of 1857, page 527, a Report of Central Society of Agriculture of France.)

There are accounts also of its having been tried in Africa and Australia, and with success; but so far as we learn not for the disease we have been treating of, but for "Pleuro-pneumonia" and we believe the two Epizootics have been not unfrequently confounded. Should the disease again appear, the practice of inoculation may be, and will be, here tried, and the results made known. It would be most hazardous to recommend the experiment, except as an experiment, and one on which we are quite unable at present to risk an opinion.

We would suggest that wherever there are large gatherings of cattle, as at some of our large fairs and Agricultural Exhibitions, a veterinary surgeon should be officially appointed to inspect all cattle brought to these places, and any cattle suffering from any disease should at once be removed and subsequently dealt with, as the Inspector in consultation with the Police Authorities might deem expedient. Should the cattle be condemned to be killed, the owner might be wholly, or in part, remunerated for his loss.

Having thus submitted our views of the nature of the Calcutta Epizootic and its treatment, we may conclude this paper by a brief summary.

1st.—The cattle disease, which assumed an epizootic character in Calcutta in 1864, was not the result of the herding together of cattle at the Exhibition; nor did it break out there; it existed in a grave form prior to the Exhibition.

2nd.—The disease is of a highly infectious and contagious nature, but we have no grounds for concluding that it was imported into the neighbourhood; it has existed in a sporadic form for years before it assumed a true epizootic character.

3rd.—The symptoms, progress, and great fatality, all lead to the conclusion that it is the same disease as that known as the Rinderpest, which always exists in certain parts of Russia, and is the same Epizootic as that at present raging in England.

4th.—That it is confined to the bovine race, and is not communicable to other animals, nor to man. (Mr. Floyd's account however would rather negative this, as he believes two horses caught the disease and died of it)

5th.—That although no specific has been discovered, yet that judicious and careful treatment promises success. Such treatment consists in mild purgatives combined with aromatic stimulants, and diffusible stimulants, as ether, nutritious and stimulating drenches, such as beer drenches, counter-irritants, free circulation of air, and scrupulous cleanliness.

6th.—That careful hygienic measures are of the greatest importance such as wholesome food, pure water, fresh air; removal from jungles and other sources of malaria, and in case of an invasion of the disease, complete and absolute separation of the healthy from the diseased and suspected cattle, the immediate destruction of every article or substance that can hold the infectious properties of the disease, and careful cleanliness of the premises occupied by cattle and disinfectants scattered on the floors, &c.

We would lastly draw attention that, although the disease we have been treating of, is one of the most fatal, it appears to be one the least generally recognized, amongst the several Epizootics in India, to which diseases, the term Ghootee or Bussunt, or some other name signifying Small-pox is given, yet that no true Variola or Small-pox really appears in any of the descriptions. The very fatal Epizootic in which vesicular eruptions are observed, is probably the Eczema Epizootica. Pleuro-pneumonia is doubtless common; and the disease which we have treated of is the "Rinderpest."

In India we were accustomed to the terms "cattle plague" and "cattle disease," when our attention was drawn to the subject in 1864, and our fears that the Epizootic would become more formidable than it did, were aroused. We hear much now of "cattle plague" and "cattle disease" in England; no distinguishing name has been given it; it is not even classified so far as we know, and we have therefore in the want of a better term designated the disease we have treated of as the "Calcutta Epizootic of 1864."

C. PALMER, M. D.,
Presidency Surgeon.

2.—ON THE REVERSION AND RESTORATION OF THE SILKWORM (PART II.) WITH DISTINCTIVE CHARACTERS OF EIGHTEEN SPECIES OF SILK-PRODUCING BOMBYCIDÆ. BY CAPTAIN THOMAS HUTTON, F G.S., OF MUSSOOREE. (COMMUNICATED BY MR. F. MOORE.)

[Read December 5th, 1864.]

ACCORDING to hitherto received notions all the silkworms now under domestication are mere varieties of one species, and are all placed together under the name of *Bombyx Mori;* and yet the difference in habits is alone sufficient to point out the existence of several totally distinct species.

This circumstance, when some time since noticed by myself in a letter to Mr. F. Moore of the India Museum, elicited the acknowledgment that Entomologists in Europe had long suspected the fact, but that they were without the means of working out all the necessary details, many of the supposed species not being under cultivation in Europe, while no one in India had deemed it worth while to enter into an investigation of the subject.

From the moment, however, in which I first recognized the absolute necessity of endeavouring to arrest the rapid strides which disease was making towards the extinction of the silkworm, I became aware, from actual inspection of the worms through all their changes, of the existence of several species, and I at once determined systematically to set to work for the purpose of extricating each from the dark labyrinth of error and confusion in which it had become involved.

Any one at all conversant with the *Bombycidæ* must be aware of the fact that, for the most part, the species will, in the northern and colder districts of their respective countries, be either strictly annuals, or at the most double-brooded, while those species which yield several crops of silk during the year, indicate thereby that they were originally imported into the localities where they are now domesticated, from the warm and more prolific lowland regions of the South. A rapid succession of crops, whether of vegetables or of silk, such as we witness among what are in Bengal termed 'monthly worms,' is obtainable only, whether naturally or artificially, in a mild climate favourable to the rapid growth of vegetation. To the preservation of such species, when in a state of natural freedom, the healthy condition of the mulberry leaf until the commencement of the winter months is indispensable, and such a condition of things is obtainable only in a warm and probably humid climate

At Mussooree in the North-Western Himalaya, nature herself speaks forcibly in support of this view when she presents for our consideration *twelve* wild species of the *Bombycidæ*, eleven of which are here strictly annual, and one only is double-brooded, though some of these in warmer parts of India are found, even in the wild state, to yield two and even three broods.

Meditating on this fact, it occurred to me that if this could be relied upon as a distinguishing feature, the annual domestic worms would doubtless, on investigation, be found to be specifically distinct from the so-called "monthly worms," and the result has proved the correctness of this view, the Cashmere and Bokhara Annual being not only distinct from the Bengal Annual (*Boropooloo*), but both are distinct from the "*Nistry*," the "*Dasee*," and the small Chinese species *Cheena*, which are distinguished as monthly worms. Were they not specifically distinct, why do not the annuals when cultivated in Bengal become monthly, like the others? or, again, why do not the monthlies become annuals in the North? By their not undergoing these changes we are furnished with proof that it is not a change of climate which makes the alteration, but that nature has stamped them with distinctive characters and habits.

We have all read or heard of complaints in regard to the uncertain quality of the silk sent as that of *Bombyx Mori* to Europe from Bengal, and that it is on that account held in less estimation than silks from other countries. This variation in quality arises from the cultivation of these several distinct species under the name of *B. Mori*, precisely as all Eria silks were supposed to be derived from *Attacus Cynthia.* These worms being of different sizes and always much smaller than the larvæ of *B. Mori* (which species by the way is not cultivated at all in Bengal), must necessarily produce a silken fibre of far greater fineness than it; from which it results that not only is the reeled silk much finer than that of the true *B. Mori*, but each Bengal worm differs from the other in the thickness of its fibre, and as all goes home nominally as the produce of the same worm, no wonder that an outcry is raised about the uncertain thickness of the fibre.

This discovery of several distinct species confounded under the name of *B. Mori*, although admitted by competent judges in Europe, has in India been sneered at, and the differences perceptible in the size, colour, markings and habits of the worms, and the form and texture of the cocoons, have been attributed to the effects of climate only. Climate, however, has no such influence, since we find each species, in whatever climate cultivated, preserving the very same characteristics. If the differences at present perceptible were in reality merely the effects of climate and of peculiar treatment, we might surely expect that when a change of climate and treatment was experienced some marked and decided change would soon be perceptible in the insects likewise; but this is not the case, each retaining at Mussooree, in Oudh, and elsewhere in the Northern Provinces, the very same characteristics as when in the damp warm plains of Bengal. The characters, in fact, are constant, no matter where the insects may be.

Characters, whether of form, colour or habits, if permanent and unchangeable, are to all intents and purposes specific characters, and even Mr. Darwin admits that when one of his supposed varieties attains to a certain degree of stability, it assumes, *pro tem.*, the value and importance of a species until variation again commences at some after period among the offspring.

Under any circumstances, therefore, these insects, whatever they may originally have been, having now severally attained to permanency of characters, have become true species, and as such must be accepted and described.

Genus Bombyx, Schranck.

The genus *Bombyx* appears naturally to divide itself into two well-defined sections or sub divisions, the first comprising all the domesticated Chinese species of which the larvæ have hitherto been known to cultivators and men of science as being of a pale creamy-white colour, and furnished only with one fleshy semi-horny sharp-pointed spine, springing from the dorsal centre of the penultimate segment; the other containing the wild and uncultivated species, whose larvæ are not only richly variegated with a number of bright colours intimately mixed together, such as ashy-grey, livid green, yellow, rufous, ferruginous and black, but are likewise furnished with from four to six longitudinally disposed rows of fleshy or semi-horny spines all curbing backwards, besides one long one on the penultimate segment, placed between the two dorsal rows and pointing in the opposite direction.

Of the insects contained in this last section, one feeds on the wild indigenous mulberry tree of the North-Western Himalaya, and yields a first-rate silk, which however can not be turned to much account, as the worm is too intractable to submit to domestication, and can only be reared upon the trees in the open air, which of course renders the crop precarious, through the incessant attacks of birds and insects. This species was discovered by myself at Simla in 1837, but owing to illness and the subsequent breaking out of the Afghan war, was not sent to Europe until 1842, when the moth was figured by Mr. Westwood in "The Cabinet of Oriental Entomology," under the name of *Bombyx Huttoni.*

A second species occurs sparingly in Bengal, in the neighbourhood of Calcutta, where it feeds on the leaves of the *Artocarpus lacoocha,* and to which I have assigned the name of *Bombyx Bengalensis.*

At Singapore, or in its neighbourhood, is a third species, called by Mr. Walker *Bombyx subnotata,* though nothing more than its existence appears to be known.

A fourth species is found in Assam, where it feeds on the leaves of the *Ficus religiosa* or Peepul tree, and is distinguished as the *Bombyx religiosa* of Helfer.

And lastly, so far as continental India is concerned, the *Bombyx lugubris* of Drury is said to occur at Madras, though the statement appears to require confirmation, and Mr. Moore even doubts its being a *Bombyx* at all.

These two sections of the genus *Bombyx* being remarkable for the presence in the one, and the absence in the other, of bright colours and rows of spines in the larvæ, led me to entertain a suspicion that the Chinese domesticated species are no longer in their original condition; and following up this idea by a series of experiments, I soon discovered that with respect to colouring, the *Bomybx Mori*, and one or two others, when partially reverted to a state of nature, show a great and marked approach in the distribution and arrangement of their colours to the wild species of India.

Besides the genus *Bombyx*, this group of the family contains the genera *Ocinara* of Walker, and *Trilocha* of Moore; of the former I have discovered two, if not three, new species, and I understand that others have been discovered in Bengal. In the larva state this genus, although showing alliance with *Bombyx*, appears likewise to approach the *Geometræ*, the caterpillar generally having, not only something of the manner of the latter, but possessing also several of those curious little excrescences which give a Geometer the appearance of a dry stick with withered buds. The larvæ of *Ocinara* spin a small neat cocoon resembling that of some of the smaller *Bombyces*, but there is not silk enough to render them worth cultivating. The larva of one of my Mussooree species, unlike the others, is hairy.

Before proceeding further it may be well to observe that in France and Italy, where none but annuals can be cultivated, the same degree of uncertainty as to species appears to prevail; *four varieties* of *Bombyx Mori* are there distinguished from each other as follows: —

First. The small silkworm of three casts or moults.

Second. The large silkworm of four moults.

Third. The common white silkworm of four moults.

Fourth. The common yellowish silkworm of four moults.

The eggs of the first of these are said to weigh one-eleventh less than those of the common silkworm; that is to say, that while 39,168 of the latter weigh an ounce, it requires for the same weight 42,620 of the smaller one. The worms and cocoons are also said by Count Dandolo to be two-fifths smaller than those of the common sort. "The cocoons, also," he says, "are composed of finer and more beautiful silk, whence it would appear that the silk-drawing tubes are finer in these silk-worms." The cocoons are better constructed, and afford in proportion, at equal weight, a greater quantity of silk. The worms, likewise, come to maturity four days earlier than the common sort. Six hundred concoons weigh 1½ lbs. In the south of France, according to M. Boitard, this race is known as the Milanese worm, being common in Lombardy.

With regard to the second variety we are told that it is cultivated chiefly "dans le Frioul." The difference in the weight of the eggs between this and the common sort, or fourth variety, is given as one-fiftieth only, that is to say, 39,168 eggs of the latter go to the ounce against 37,440 of the former, which are thus the heavier. One hundred and fifty cocoons weigh a pound and a half, while 360 of the common sort make the same weight. This variety requires five or six days longer to bring it to maturity.

The third variety is said to have been imported from China by the inhabitants of the "*arrondissement d' Alais,*" and is common both in France and Italy; it differs from the others in constantly producing white cocoons, the silk of which is said to be finer than that of the common sort.

The fourth variety, which appears to have been selected as the standard of comparison, is the commonest of all and is cultivated generally in France and throughout Europe. The cocoon is a yellow of different degrees of intensity.

Now the question arises—Are these to be considered as merely local and climatal varieties of *B. Mori*, or can any of them be regarded as true and distinct species?

With regard to No. 1, it is said that although in Italy nine out of ten cocoons are white, yet that in France the majority are yellow. No stress, therefore, can be laid upon the colour of the silk as a specific character, but a valid mark of distinction would (if there is no mistake) appear to exist in the fact of the worm undergoing only three moults instead of four as in all the others.

That this worm, however, is not in a healthy state is clearly to be seen in the change produced on the colour of the silk by change of climate, the heat of Italy producing white, and the cooler and more natural temperature of France producing yellow cocoons. But if this worm be a mere variety of *B. Mori* induced by climate, Count Dondolo's remark that the greater fineness of the silk is attributable to greater fineness in the silk-drawing tubes, at once proclaims the unhealthiness and degeneracy of the worm, which has dwindled down from its natural size and is no longer able to yield a fibre of the original thickness. If then this is a mere climatal variety of *B. Mori*, the peculiarities in its moulting, and the changeable colour and fineness of the silk, can be attributed to nothing else than loss of size and constitution.

If climate has been the agent by which this variation has been brought about, how is it that the entire race of *B. Mori* has not been affected in a similar manner? Yet in Italy, in France and in other countries of Europe, *B. Mori* still continues not only to hold its ground side by side with this supposed variety, but is in spite of climate stated to be still the commonest of all.

An Indian sericulturist rising from the perusal of Reports on the Culture of Silk in various parts of the country, will find perhaps that no two of these agree in the length of time consumed between the hatching of the egg and the spinning of the cocoon. The explanation is, that the reports do not all apply to the same species, for at Madras, and in Bengal proper, the true *B. Mori* is nowhere found, and it has only very recently been tried, and with no very encouraging success, in the North Western Provinces of Upper India. But the time that elapses between the hatching of the egg and the spinning of the cocoon will vary even in the same species, according to the temperature in which the worm has been reared, and likewise, in some measure, according to the health of the insect. As a rule, the whole process will be more rapid in a high temperature than in a colder one, and it is to be observed that the longer the time consumed, the better, in general, will be the cocoon, for the simple reason that the worm has had ample time to come to maturity, whereas when the growth is forced and accelerated by high temperature, although the worm may grow to a goodly size, it will still have passed through its different stages so rapidly as materially to diminish the quantity of silk-gum, which it has not had time to secrete. The cocoon will, consequently, be less stuffed with silk than when, all other things being equal, a longer time has been consumed. Count Dandolo lays it down that thirty-two days elapse between the hatching of the egg and the formation of the cocoon, and he adds four days more for the completion of it, or thirty-six days in all. This likewise is the time given by M. Boitard as applicable to the worm in France. Dewhurst informs us that in England forty-six days are consumed. In China, according to published accounts, the time varies greatly, being from twenty-three to twenty-eight and sometimes forty days, with an additional seven days, allowed for the cocoon, so that we have thirty, thirty-five and forty-seven days given as the time. Contrary to all experience also, it is said that the *shorter* the time consumed, *the more abundant* will be the crop of silk, twenty-three to twenty-five days producing twenty-five ounces of silk from one dram's weight of newly thatched worms; twenty-eight days yielding only twenty ounces, and thirty to forty days producing no more than ten ounces. This is clearly an absurdity, for it shows that the longer the worm continues to secrete gum, the less silk will it produce. Dr. Anderson, as quoted by Dewhurst, says that in Madras twenty-two days only are required; while Mr. Cope of Umritsir gives twenty-eight to forty days, but whether for the Punjab or elsewhere is not stated. At Mussooree I have found the time consumed by *B. Mori* to run from forty-six to forty-eight days. At Lucknow in Oudh, Dr. Bonavia gives "about forty-six days" for *B. Mori*, and seventeen for the small Chinese monthly worm in the month of June, and fifty-one days in November.

It is evident that these statements cannot all apply to the same species. In France and in Italy, in England, Oudh, the Punjab and Mussooree, the reference is to the annual *Bombyx Mori*, known in Europe as "The common silkworm of four moults," and in India as the Cashmere or Bokhara worm.

The time, therefore consumed by *B. Mori* in France and Italy is about thirty-six days; in England, Oudh, Punjab and Mussooree, about forty-six days.

Mr. Cope, in a Lecture on Silk delivered at Lahore, gives (as before mentioned) from twenty-eight to forty days as the time consumed. If *B. Mori* spins its cocoon in twenty-eight days from the time of hatching, a stronger proof of the total unfitness of the Punjab climate for the culture of that species could not be furnished. The fact, however, is that the time laid down in the lecture cannot satisfactorily be applied to any species in particular, but evidently includes more than one.

The Chinese account likewise would appear to have reference to more than one species, while in Madras, the species referred to by Dr. Anderson was, in all probability, one of the three monthly worms, because the true *B. Mori* is nowhere cultivated below the North Western Provinces.

The true time consumed from the hatching of the worm to the completion of the cocoon would, consequently, appear to range from thirty-six to forty-six days, and the more rapid progress made in Europe is probably to be attributed to the fact of the worms being shut up in rooms with a temperature of 68° to 77°, which is altered after every change of skin. Thus, Dewhurst says, "75° is the degree of heat they should be kept in until the first casting or moulding; between 73° and 75° until the second moulting; between 71° and 73°

until the third; and lastly, between 68° and 71° until the fourth moulting".

From this statement we perceive that, according to this writer, the temperature should be reduced as the worm advances to maturity, a procedure which is diametrically the reverse of that published by nature. According to the same authority "it has been proved, by a series of experiments, that in France 68° is the heat most suitable to silkworms; some cultivators have raised it as high as 77° with good success, while M. Boisseur de Sauvages has even gone as high as 100°."

At Mussooree I have always reared the worms in an open room, so that, as the external temperature varied, that of the interior varied likewise, and the air was always fresh and natural. The eggs hatched spontaneously in a mean temperature of 64°, and the thermometer never rose beyond 68° up to the time of spinning the cocoon. During the same time the daily mean of the external temperature ranged from 47° to 66°, so that the French view of the matter is thus proved to be the most correct. I have shown, moreover, that I found great difficulty in checking the hatching of the eggs even in a temperature of 58°, and only did so at last by placing them out all night in frosty air of December, at an elevation of 5,400 feet.

The small Chinese monthly worm (*B. Sinensis*) required in the month of June, in the warm climate of Oudh, no more than seventeen days from the hatching of the egg till the formation of the cocoon, while, in the cooler temperature of November, fifty-one days were consumed. At Mussooree, the same species, hatched on the 26th of June, spun the cocoons in twenty-eight days; while the *Boro-pooloo* (*B. textor*), which was hatched on the 14th of March, began to spin on the 28th of April, consuming thus forty-six days, or the same as *B. Mori*. This circumstance, together with the similarity in the marking, and the occurrence of black worms in the brood, has led Dr. Bonavia somewhat hastily to conclude that the Cashmere worm and the Boro-pooloo are one and the same species, an error into which he could scarcely have fallen, had he given due weight to the fact that not only is the worm a full inch shorter than that of the Cashmere worm, but the size, colour and texture of the cocoons are all totally distinct, and no naturalist could ever confound the one with the other. These differences, moreover, are permanent, even where the species are cultivated together, and the occurrence of black worms merely shows that the Boro-pooloo, like *B. Mori*, has completely lost its constitution. Black worms are also occasionally found in the broods of the *Nistry* (*B. Crœsi*), which is undoubtedly distinct.

If, then, we unite all the species under the one name of *Bombyx Mori*, we shall find that the time consumed from the hatching of the egg to the spinning of the cocoon will vary in the same climate from seventeen to forty-six days, a circumstance which is alone sufficient to point out the incorrectness of such an arrangement: while if we more reasonably insist upon there being several distinct species now confounded together, the difficulty at once vanishes, and the difference at present observable is satisfactorily accounted for.

I shall, therefore, now proceed to unfold my views on this subject, and show, from the peculiarities observable in each species, upon what grounds I insist upon specific distinction.

1. BOMBYX MORI, Linn.

Synonymes.

Phalæna Bombyx Mori,	Linn. S. N. 1, 2, p. 817 (1767); Amœn. Acad. iv. p. 563; Faun. Suec. p. 832; Aldrov. Ins. p. 280; Albin. Ins. pl. 12, f 16; Reaum. Ins. ii. p. 5, f. 2; Rœsel. Ins. iii. pl. 78.
Bombyx Mori .	Fab. Spec. Ins. ii. p. 180; Mant. Ins. ii. p. 114; Ent. Syst. iii. 1, p. 431; God. Lep. de France, iv. p. 153. pl. 14, f. 3, 4; Walker, List Lep. Het. Brit Mus. pt. 6, p. 1505; Moore, Cat. Lep. Mus. Ind. House, ii. p. 374.
Sericaria Mori	Blanchard, Gay, Hist. de Chile, Zool. vii. p. 55.
Lasiocampa Mori .	Schranch.
Lasiocampe du Murier	Boitard, p. 148.

The common domesticated Chinese silkworm of Europe.

Habitat.—Originally the northern mountainous provinces of China, especially that of Tche-kiang; now domesticated in China generally, in Cashmere, Afghanistan, Bookhara, Persia, Syria, France, Italy, Spain, Sweden, Russia, &c., and recently introduced into Oudh and the Punjab.

The species termed by the late Dr. Royle "*Pat major*" refers not to this, but to the Bengal Annual known as *Boro-pooloo*, while that mentioned by Dr. Helfer in the J. A. S. B., vi. p. 41, as cited in Mr. F. Moore's "*Synopsis*," probably refers to one of the monthly worms which have hitherto passed under the name of *B. Mori*, a species which, at the time when the Doctor wrote, was confined to Cashmere, and was certainly not cultivated in any part of Bengal or the Lowland Provinces.

The word "*Pat*" appears to be used as a generic term.

Larva.—Originally from the northern parts of China, the worm of *Bombyx Mori* is now extensively cultivated for its silk, in various countries both of Asia and of Europe, and everywhere thrives best where the temperature is moderate. It is the largest and the strongest of the domesticated species, and is an annual, producing naturally but one crop of silk in the year, although in certain temperatures it is possible to make it produce a second crop.

When first excluded from the egg the young caterpillar is hairy and of a dark-brown colour, the edge of the anterior segment being ashy white ; the head and prolegs are shinning jet black.

In the course of four or five days the five anterior segments become slightly swollen, exhibiting a mottled appearence of brown dots and small patches on a livid ashy ground, and previous to the first moult, these segments become altogether livid ashy, while the others are of a pale brown ; there is one short tubercle or spine on the middle line of the penultimate segment, and the hairy appearance of the young worms is owing to short tufts of hairs springing from rows of rudimentary tubercles as in the wild and uncultivated kinds. These, however all disappear, with the exception of the anal spine, after the first moult.

In the second stage, the four anterior segments are of an ashy white, the dorsal portion of the second and third segments being swollen and wrinkled ; the remaining segments are pale brindled, or mottled grey, with a slightly mealy aspect ; a short, blunt, somewhat flat-sided, semi-horny tubercle on the dorsal centre of the penultimate segment, and having generally a faint tinge of orange ; on the fifth segment are two faint semilunar brown marks like inverted commas, and on the eighth segment are two small round spots of brown ; head and prolegs black.

After the second moult the insect becomes altogether of an ashy or creamy whiteness, the second and third segments still more swollen and wrinkled ; on the front of the second is a thin longitudinally disposed dark line with generally a small dark spot on each side of it ; two dark semilunar marks on the back of the fifth segment, and the dark spots on the eighth slightly raised ; anal horn pointed and somewhat suddenly attenuated, with an inclination to point backwards ; head mealy grey-brown, and small as compared with the rapidly increasing size of the body.

In the two following stages there is usually no alteration, except that the length and thickness of the worm rapidly increase, and that the markings become more conspicuous, that on the fifth segment often assuming the form of a crown. The feet are fringed with minute cilia. The entire body is without hairs and quite smooth ; the stigmata or breathing apertures along the sides are small, round and dark, and in the last stage of growth the two dots on the front of the second segment increase in size and are partially rufous. The length of a full grown worm, cultivated at Mussooree, is from 3 to 3¼ inches.

Such is the appearence of the worm as now cultivated but in almost every batch of worms there will be seen after the first moult has occurred, some dark-coloured ones which at the first glance appear to be a distinct species. By the French these worms are regarded as a mere evanescent variety and are distinguished as "*vers tigrés*" and "*vers zébrés* ;" so far, however, are they from being a mere passing variety, that they are actually types of the original species, and merely require to be treated according to the established rules of breeding in order to render them permanent and healthy.

The Black Worm.—When first hatched the caterpillers are in all respects similar to those of the pale variety, and it is not until after the first, and sometimes second, moult has taken place that any difference is perceptible ; then, however, instead of having the four anterior segments of a creamy-white, the whole body is of a dark-brindled or mottled-grey colour, with the exception of an ashy band or broad stripe, which, crossing in front of the anterior segment, runs round on each side as far back as the middle of the fifth segment, widening up towards the back, but leaving a dark-brindled dorsal space between them ; at a later stage, when the worm is near maturity, this ashy band becomes less clear and bright, and is often tinged faintly with clay colour, or even with a fleshy roseate hue ; on the fifth segment the two dark lunules are well defined, and have an ashy patch between them ; the dark spots on the eighth segment are sometimes wanting, as they are also in the white variety.

In the third and fourth stages the colouring generally becomes very dark, in some intensely so, and takes the form of a net or trellis-work spread over an ashy-grey ground. As the worm approaches the spinning time the colours again become fainter, and often assume a grey sandy-brown hue, overlaid by the dark network. The anterior portion of the second segment rises somewhat abruptly, and from it, through the dorsal centre of the first, runs a narrow black longitudinal line, on each side of which, on the second segment, is a round black spot, perpendicularly divided by a pale orange line, causing the appearance, as it were, of two eyes.

Such is the appearance in the first year of the separation from the white worm; the differences in after years, of course, become more marked, though the general character is the same.

After two or three years of separation and the restricted interbreeding, the appearance, especially in the middle stages, is very dark indeed, and the whole insect looks as if overlaid by a well-distended net, the meshes of which are open and well defined; it is, indeed, this well-defined marking, together with the ashy lateral band along the anterior segments, which makes the species approximate to the wild races, the lateral band more especially being a characteristic of the wild worms.

Progress of the Experiment.—In the previous part of this paper I have shown the result of my experiments up to the end of 1863. I now proceed to show the condition of the worm in the spring of 1864, when the eggs, deposited in the spring and autumn of the past year, began to hatch on the 21st of March in a temperature of 65°.

First, then, with regard to the white worms, it was observed that, although for two years running the black worms had been all weeded out from them, yet the per-centage of dark worms was far greater than before; showing thus, according to the experience of cultivators, a great accession of strength and health; great numbers of the eggs likewise adhered firmly to the paper on which they were deposited, instead of being loosely scattered as heretofore, but the white worms have never yet produced a second crop. This variety, though far from being in the best health, showed no increase of degeneracy over previous years.

With regard to the black worms, they hatched on the same day with the others, although some had been deposited in spring and others in the autumn of 1863. All were decidedly unhealthy, although those from the autumn batch were far less so than those of spring, the latter being so terribly affected with jaundice, and with some disease that turned the worm dull green, that I was compelled to throw the whole away. The worms from the autumnal batch went on well enough and spun good cocoons, the moths from which deposited a goodly number of eggs in the end of May, and these began to hatch for a second crop in September, 1864. They are apparently healthy, and from a few of their eggs I shall carry on an experiment for amusement, but I feel fully persuaded now, after several years of observation, that the constitution of the worm has been so throughly undermined that, although we may be able to restore it to its natural appearance, it will never be able thoroughly to shake off the various diseases to which it has so long been subject. The only way open to the sericulturist is, therefore, to re-seek in the original habitat in China for the wild worms in their natural state of freedom on the trees, and should any of these be procurable, then may the entire stock in Europe be gradually renewed, and the present impending ruin be averted.

Dr. Bonavia of Lucknow, the active and enterprising secretary to the Agri-Horticultural Society of that province, having in the spring of 1864 furnished me with a few eggs obtained from Marseilles, I proceeded to ascertain whether they differed from the Cashmere worm or not.

These began to hatch, in a temparature of 67°, on the 4th of April, when the Cashmere worms were already fifteen days old; in the batch were a few of the dark coloured ones, but none, whether dark or white, appeared to be healthy; still they were not worse than their congeners, and eventually spun better cocoons, being, although not so large, much more stuffed with silk. Between these worms and those from Cashmere stock there is not a shade of difference, both being *B. Mori.*

Imago.—In the moth the ground colour of the wings is a dull ashy white; sometimes they are entirely ashy, without any lines or other markings, while some have only two short parallel lines on the fore-wings near the centre of the costal margin. In others there are lines as below described, but no colours. These are from the white worm as now cultivated.

The appearance of moths produced from black worms approximates more to the wild *B. Huttoni*, both in colour and in markings.

In these the ground of the wings is still ashy, and the male, as usual, is smaller than the female, having the shaft of the antennæ white, with duskey black plumes; eyes black; body and ground of wings ashywhite, suffused with a pale brown tinge; near the basal angle of the fore-wing are two parallel lunate lines, the horns of which point inwards and rest upon the anterior and posterior margins; between these lines darkish brown, in some instances blending them into a brown band, in others the lines are clear and distinct; about the middle of the costal margin, at a little distance within the wing, are two very short parallel lines slightly curved in the opposite direction to the basal ones; these, however, are sometimes absent; across the wing, from the anterior to the posterior margin, are two partially parallel submarginal lines at a little distance apart, the inner one being a slight curve and the outer one taking a bend or lunate sweep near the exterior and posterior angle; these lines are sometimes distinct and clear on the ashy ground, at others they are blended into a dark-brown band by the deep suffusion of the space between them. Fore-wing strongly falcate in both sexes; the hind-wing is rounded on the exterior margin; abdominal margin folded down as in *Ocinara*, with one blackish spot about the middle; from the anterior to the abdominal margin are two subparallel lines through the disc of the wing, curving parallel to the outer margin, sometimes distinct, at others blended by the suffusion of the inclosed space with brown. The female is much the same, but there is in both sexes the greatest variety in the markings, which is, I think, a clear indication that the insect is not in a natural condition or sound state of health. The under-side dull ashy, with the dark lines and bands visible, as above. The male often exhibits ashy wings, with brown bands, and the body dark grey. Expanse of wings, in the female 2 inches; in the male 1¾ inches, although the size varies as much as the colouring.

2. BOMBYX TEXTOR, Hutton.

Syn. *Bombyx Mori* of Indian sericulturists.

The *Boro-pooloo* of Bengal; "*Pat-Major*" of Royle.

This species, hitherto confounded with the preceding, is said to have been introduced from China, where it is still cultivated, under the name of the *white cocoon*, but the time of its introduction into India appears to have beeen forgotten.

In Bengal, as well as in its native country, it is an annual, hatching early in the spring, usually in January, yielding generally pure white cocoons, far inferior in size to those of *B. Mori*, and altogether of a different shape, character and texture, having an inclination to become pointed at each end, and with the silk not closely interwoven, but externally somewhat flossy and loose, whereas the cocoons of *B. Mori* are closely woven, compact, hard and smooth, ovate in shape, and four or five times larger; some that I have received from France being little inferior in size to those of the Tussur moth (*Antheræa Paphia*).

The worm, when mature, bears a strong resemblance to that of the preceding species, but is much smaller both in length and thickness, and, as a strong mark of distinction, it may be observed that it preserves all its characteristics unchanged, even when cultivated in the same climate and in the same manner as *B. Mori*, neither of the species exhibiting the slightest indication of adopting the peculiarities of the other.

In [illegible] Report on Sericulture in Oudh [illegible] he [illegible] textor,—"I can not find any reason to believe that this worm belongs to a different stock from the Cashmere and Bokhara worms;" others have said the same thing, which only proves to me that they have never looked beyond the worm itself, since had they done so they might have found, as I have done, abundant proofs of specific distinctness.

The same gentleman proceeds to inform us that—"Captain Hutton favoured me with a small quantity of eggs of his selected dark-coloured worms. According to his views the dark coloured variety approaches more to the wild kind, and therefore has more healthy blood in it than the white variety, which he considers as a degeneration of the original worm. It is strange though, that the "Boro-pooloo, which has been reared in Bengal for a long time, contains a large number of the dark variety. One would be inclined to think that, considering the bad mode of rearing and the climate of Bengal, it would have degenerated into the white variety by this time, according to Captain Hutton's theory."

The writer, however, shows by the admission that "a large number of the dark variety" occurs amongst the Boro-pooloo worms, "that Captain Hutton's theory" actually does hold good. Just as with the originally dark-coloured worms of *B. Mori*, so also the originally dark-coloured worms of *B. textor* "have degenerated into the white variety." *The occurrence of these dark worms, as I have previously pointed out, is due to an effort on the part of nature to return to the original* stock, from the sickly degenerated state into which the species have fallen.

Again we are told, that, "the selected dark-coloured worm of Mussooree did very well, but I could not detect any difference between the cocoons of these and those of the white Cashmere ones. I selected many of the black ones of the Cashmere, Bokhara and 'Boro-pooloo,' and kept them separate, but did not find that they produced better cocoons than the rest, and they all had one disadvantage, that is, on account of their colour, it was not easy to discover when they were ready to spin."

Be it observed, however, that in furnishing these dark-coloured worms, I did not guarantee the same results in Oudh as are obtainable in the European climate of Mussooree. I should not have been at all surprised to hear, considering the heat of Oudh and the inexperience of the conductor of the experiments, that every worm had returned to a state of sickly whiteness. As to the difficulty of discovering when they were ready to spin, this could only have occurred to an unpractised eye, since there is always a semi-transparent yellowish waxy hue about a mature worm that is quite unmistakeable to an experienced eye.

According to Mr. C. Blechynden and Mr. Bashford, this species is the one that in Bengal is recognized as "*The Italian Stock*;" in which case it would appear to be identical with that which in France is termed "*The Milanese worm*," though if such be the case, how are we to account for its only undergoing three moults in France and Italy, while in India it invariably has four, like all the others? I incline very strongly to the belief that this alleged peculiarity is altogether fabulous.

In Bengal, according to Mr. C. Blechynden and others, the worm is also sometimes dark coloured like those of *B. Mori*, thus showing clearly that it is not in its original healthy state; the worms attain length varying from 2 to 2½ inches, as is the case also at Mussooree.

As regards the colour of the silk, nothing could more strongly support my view that white is a sign of weakness and degeneracy. In Italy, we are informed, there are generally nine white cocoons in every ten,—but when cultivated in France bright golden yellow is the predominant colour; this is undoubtedly an effect of climate, showing that the warmth of Italy is less adapted to the health of the insect than the cooler temperature of France, which in some districts is nearly the same as that of Mussooree, where precisely similar results have been observed. The eggs of this species, hatched in March, 1864, from the deposit of May, 1863, gave seventy-eight black to thirty-one white worms, in a batch of 109, whereas in 1863, eggs procured from Bengal produced white worms without a single exception. The cocoons spun in 1863 by the Bengal worms were all white, with the exception of about half a dozen, whereas in 1864 there was not one white cocoon, all being of a bright golden yellow. In China, as in Bengal, the usual colour is white, with an exceptional sprinkling of yellow cocoons. Here we have the effect of climate distinctly marked, and showing that while a high temperature produces both white worms and white silk, a temperate climate, by imparting strength, produces dark worms and yellow cocoons.

The worm which in France gives permanently a white cocoon, and which was imported from China into the "*arrondissement d'Alais*," would appear to be distinct both from *B. textor* and the other two varieties; so that if No. 1, or the Milanese worm, be our *Boro-pooloo*, as

I suspect is the case, and Nos. 2 and 4 are true *B. Mori*, then No. 3, with the permanent white silk, is in all probability a distinct species.

The changes in the appearance of the caterpillars of *B. textor* are precisely similar to those observable in *B. Mori*, and need not be repeated; when first hatched, the worms of *B. textor* are rather black than brown, and although in the after stages there is in the colouring and marking of the two species no really tangible and well-defined distinction, yet at the same time there is to the eye a perceptible difference in the shade of colouring, which is darker, more *prononcé*, more equally diffused, and more of a neutral tint in *B. textor* than in *B. Mori;* the latter, besides attaining to a far larger size and forming a totally different cocoon, has the dark parts less purplish and not so generally diffused. These remarks, however, pertain to the black worms only; the white ones differ in no respect except in size.

Having now disposed of the Annuals, we have to consider the question of distinction with regard to what are commonly termed "Monthly worms."

3. Bombyx Crœsi, Hutton.

Syn. *Bombyx Mori*, var., of Indian sericulturists.

The "*Nistry*." and "*Madrassee*" worm of Bengal.

This is a much smaller species than either of the preceding, yielding seven or eight crops of silk in the year; the cocoon is small, of a beautiful bright yellow colour, and of a somewhat loose and flossy texture. It is said to thrive best in the summer months from June to October, and at other times is only kept up to preserve the stock. In hot weather it goes through all its changes from the egg to the cocoon in twenty-five days, but in the colder months it occupies thirty-five days. The worm is from 1½ to 2 inches long, and is of a clear silvery or pearly hue, having a moist dewy appearance. The anal spine is short and truncated, and the dark lunar marks, which are so conspicuous on the fifth and eighth segments of the two annuals, are in this species wholly wanting. It is said never to yield white cocoons, but that dark worms occasionally appear in the brood. I suspect this to be the "*Pat minor*" of Helfer and Royle.

4. Bombyx fortunatus, Hutton.

Syn. *Bombyx Mori*, var., of Indian sericulturists.

The "*Dasee*" worm of Bengal.

This is the smallest species of the whole, and is said to be hardy, but the yield of silk is uncertain; there are no dark worms among them, and they thrive best in the cold season, occupying at that time from the egg to the cocoon about forty days, but in hot weather only thirty-three days.

The silk is of a golden yellow, and the cocoon small ; it resembles that of *B. Crœsi* in form and texture When near maturity there is a very marked and perceptible difference between this species and all the others, the worm being of a bluish leaden-grey throughout ; the ocelli or lunate marks on the fifth and eighth segments are wanting, as in the last ; the anterior segments are slightly intumescent and wrinkled ; a short pale spine on the penultimate segment. The eggs are small, and pale straw colour, remaining so until within a day or two of hatching, when they become leaden-grey.

5. BOMBYX ARRACANENSIS, Hutton.

Syn. *Bombyx Mori*, var , of Indian sericulturists.
The *Arracan* worm.

When first hatched, the Arracan worm is very small ; of a pale sandy-brown colour, and hairy, like all the others ; anterior edge of the first segment whitish, or livid ash ; head black.

I succeeded only once, many years ago, in obtaining a few eggs of this species, through the kindness of Mr. A. H. Blechynden, secretary to the Agri-Horticultural Society of India, a gentleman whom I have uniformly found ready to assist in every useful inquiry. The worms produced from these eggs were very feeble, and, refusing to feed, were all dead by the evening.

The cocoon is said to be larger than those of the Bengal monthly worms, and the silk strong and good.

The worm is supposed to have been introduced from Burmah.

6. BOMBYX SINENSIS, Hutton.

Syn. *Bombyx Mori*, var., of Indian sericulturists.
The small Chinese monthly worm.
"Sina" and "Cheena" of the Bengalis.

The worm of this prolific species is considerably smaller than that of *B. textor*, and the cocoon partakes much of the same characters, being sometimes white and sometimes bright yellow, with occasional cocoons of a beautiful faint greenish-white. The markings of the mature insect are very different from those of the *Boro-pooloo*, and from all the others.

Eggs received from Bengal began to hatch on the 26th of June ; head and pro-legs jet black and shining : the body hairy and pale brown, with minute anal horn.

On the 30th of June these worms moulted, the head and pro-legs being black as at first; the four anterior segments pale ashy, the second and third gibbous and wrinkled ; the remainder mottled ashy-grey ; a short blunt conical spine on the penultimate segment. There are also two longitudinal dorsal rows of minute round black dots, four on each segment, and giving out minute hairs ; on the fifth segment are two semi-lunar brown marks, the horns of which point inwards, as in *B. Mori* ; the anal tubercle with a few short cilia at the summit, and behind this, on the anal segment, are two minute tubercles placed close together like the sights on a gun, and behind them again lower down, and on the anal shield or valve, are two others ; stigmata black.

After the second moult, the appearance is much the same, the head and pro-legs being black ; the four anterior segments ashy ; remainder mottled iron-grey ; stigmata black ; lunules as before on fifth segment, and two small black dots on the front of the second segment.

On the 9th of July the third moult was completed, the head having changed to ashy-white ; the body entirely ash-coloured ; two small black dots in front of the second segment, and two on the posterior part of the third ; two lunules or sickle-shaped dark marks on the fifth segment, composed of two narrow dark curves enclosing one of ash ; on the eighth segment are two small brown circular spots ; in other respects as before, and still very small ; stigmata a black ring with white centre.

On the 15th July the fourth moult was completed, the worm being of a faint waxy colour with grey-brown head ; the two dots on the front of the second segment now give place to a transverse bar with a dot at each end. Two dorsal and two lateral rows of small tubercular brown dots. The marks on the fifth and eighth segments as before, but darker and more conspicuous ; stigmata a black ring with white centre. After the fourth moult the worm increases rapidly, and finally attains the length of 2 $\frac{3}{10}$ inches.

On the 22nd July they began to spin, and the cocoons were generally of a fine bright golden-yellow, although white cocoons were far from uncommon. The form and loose flossy texture of the cocoon is the same as that of the *Boro-pooloo*, but those of the latter are larger. In the spinning of the cocoon there was an immense waste of silk, arising, I suspect, from some unhealthiness, as the worms were restless and wandering, beginning a cocoon in one place, and then leaving it to seek a fresh spot, which was perhaps in turn abandoned, until sometimes all the silk was thus frittered away, and the worm either died or became a naked pupa.

On the 4th of August the moths began to issue from the cocoons, and coupled; they were very small and altogether ashy-white, without any markings on the wings.

The moths showed the presence of disease in having black inky spots upon the wings and beneath the skin of the abdomen at the junction of the segments; still they coupled freely and laid a plentiful supply of eggs, which were at first nearly white, but changed to pale yellow in the course of a few hours,

The coupling continued for about ten hours, when they voluntarily separated. The males appeared to be somewhat sluggish and the females in most cases, after the first coupling, would not permit a second.

On the 16th of August the eggs, although still of a pale straw-colour, became somewhat dusky and exhibited the black head of the young caterpillar within the shell

On the 17th these eggs had become grey and of good colour. On the 18th they all hatched in a swarm, and I found that, unlike *B. Mori*, which ceases to hatch about midday, these continued to come forth during the entire day and night, until all were excluded.

When first hatched they are about $\frac{1}{10}$ of a an inch long; and after the first moult $\frac{3}{10}$ inch; after the second moult $\frac{8}{10}$ inch; after the third moult $1\frac{3}{10}$ inch; and at maturity just before spinning $2\frac{3}{10}$ inches.

I observed a curious fact with regard to some of these eggs that were laid on the 5th of August,—about 20 of them turned vinaceous on the 10th, while all the rest of the brood remained *in statu quo.* These coloured eggs were not scattered about among the others, but formed a small group by themselves. They did not hatch with the others, but remained in the same vinaceous state until the 3rd of October, by which time the others were again laying eggs, Yet I could perceive no difference in the worms afterwards. although there had been an interval of 30 days between the hatching of the two parties laid on the same day.

This species continued to yield crop after crop even up to the middle of December, when many of the cocoons remained dormant, while others yielded moths which laid eggs that remained unhatched, the weather being very cold and variable, and no leaves remaining on the mulberry trees. Here I think we have a clear proof that at least this monthly worm could never have inhabited a northern climate, but must by nature be entirely restricted to warm lowland regions in which mulberry leaves are procurable all the year round.

It appears from some remarks of Mr. C. Blechynden that it was to this species and not to the Nistry (*B. Crœsi*) that allusion was made in Young's Magazine of Agriculture, as quoted by Kirby and Spence, and the same gentleman observes that the name given to the species by the natives is "*Sina*" or Chinese. He remarks as follows:—"The worm mentioned by Kirby and Spence does exist and is known as '*The China worm;*' it goes through all its changes from egg to cocoon in twenty-two days; so it is nothing strange to have new progeny in a month. The period may be shortened by two or three days if the room occupied as a rearing-room is kept at a high temperature; it breeds all the year round, but in the cold weather is longer in going through its mutations and does not thrive well. This might be obviated by keeping the room warm, but we should be thrown out by the want of leaves, the mulberry putting on its wintry garb of bare branches"

This information was kindly furnished from the Radnagore district, but it is equally applicable to all others in India, the time occupied from egg to cocoon varying always with the temperature in which the worm is reared, being, as with the other species, more rapid in a high than in a cold temperature, as witness Dr. Bonavia's experiments in Oudh, seventeen days in June and fifty-one in November.

Mr. Blechynden's remarks as to the worms thriving better in summer than in winter tend to support my opinion that the monthly worms belong naturally to the more genial temperature of the south, while the annuals only belong to the colder mountainous regions of the north. It is also said of this worm that "yellow cocoons will produce insects that give white silk, but that insects from white cocoons never produce yellow." Here then is a corroboration of my previous argument that white is a sign of degeneracy and weakened constitution.

From what has already been said, then, I think ample proof has been furnished of the existence of at least six species of domesticated *Bombyces,* instead of one as heretofore supposed

Before passing on to a consideration of the wild species I would say a word respecting the hatching of the eggs of *B. Mori* for a second crop: at Mussooree, where this was first observed, we have in effect what may be termed a double season or two springs, so that when after the rainy season the temperature falls back to from 68° to 62°, the eggs will again begin to hatch I have observed this both in *B. Mori* and *B. textor,* but I am inclined to think that it will only occur with worms in a transitional state, that is to say, before they have become acclimatised; and that, as soon as this has been effected the irregular hatching may be expected to cease. For three years my worms of selected *B Mori*, or the dark kind, have given a second crop ; but the very attempt to cause them to revert may have had some effect in unsettling them, for the white variety I have never found to yield a second brood. With *B. textor* the same thing occurred, and for three or four years they continued to give an autumnal crop ; this year, however (although *B. Mori* is now in September hatching in a temperature of 68°), the *Boro-pooloo* remains unhatched, although in previous years the hatching commenced about the 22nd of August, a full month earlier. I expect, therefore that *B. Mori* will eventually likewise settle down again into an annual. That the hatching is in some measure to be attributed to the alteration of climate, seems proved by the fact that the *Boro-pooloo* removed from Bengal into Oudh began to hatch for a second crop in the month of April, but was checked by being placed in a colder temperature. (Dr. Bonavia's Report, 1864, p. 8.)

Of the moths of the different species I have said nothing because I do not consider any one of them to be in a natural state ; at present, with the exception of size, the same description would apply nearly equally well to all of them ; and it is to be observed, moreover, that, even taking each species separately, there will be found a very great variety among the moths, so that it would be next to impossible to decide as to which was to be regarded as a typical specimen. Pale ashy-white, with a brownish band running parallel with the exterior margin of the upper wings, is the usual appearance, although the band is often either partially or altogether absent. This uncertainty must be attributed to the unsettled condition of the insects, and will never cease until each is restored to something like its original vigour of constitution.

Wild indigenous Species of India.

Turning now to the wild species of Continental India, we are at once struck by the fact that, instead of being exclusively restricted in their diet to the mulberry leaf, as are the domesticated worms from China, one only of the four known species is found upon that tree, while two of the others are respectively restricted, it would appear, to the *Ficus religiosa* and *Artocarpus lacoocha*, the food of the fourth species being unrecorded.

Besides this peculiarity, the wild species are remarkable for the variety and beauty of the colours with which the worms are ornamented, as well as by the presence of several longitudinally-disposed rows of semi-horny spines in addition to the dorsal spine on the penultimate segment, as possessed by all the Chinese species

These natural differences in the two sections of this group are not, however, in my opinion, sufficient to warrant the inference that the wild and the domesticated species belong to different genera, any more than the presence or absence of tails, in the species of the genus *Papilio*, could do so ; for we see that in respect to colour, the Chinese worms, when restored to some degree of health, exhibit a very different appearance from that of the worm in its usual sickly state, and that they actually make a near approach to the uncultivated species. Besides which, there are so many traits in the habits, manners, structure and produce of the two sections that are common to both, that the differences observable can be regarded only as specific and not generic ; and although the food of the wild species differs in some instances from that of the domesticated races, yet in every case the trees are found to belong to the same family, and to be closely allied to the mulberry.

I consequently feel inclined to reject the Genus *Theophila*, which Mr. F. Mooree (see Trans. Ent. Soc., 3rd Series, i. 315) proposes to establish for the reception of the wild species ; more especially since it is very doubtful whether one at least of these could stand under either *Bombyx* or *Theophila*, while as regards *B. subnotata* of Singapore, we know nothing of the larva, and therefore cannot say whether or not it exhibits the spines and other characteristics of the known wild larvæ ; and the same may be said of *B. religiosæ*.

It is this eagerness on the part of European systematists to give names to the species contained in the Noah's arks over which they preside, that leads to so much positive confusion as to what is, and what is not, a species,—a remark well illustrated by the late creation of an *Antheræa* under the specific name of *Mezankooria* (see Trans. Ent. Soc. 3rd Series, i. 318), which name is applied in Assam, by the native sericulturists, to distinguish the silk of the Mooga (*Antheræa Assama*), when fed upon the tree called *Addakoory*, from that produced by it when fed upon other trees. A very similar mistake, at which the working naturalist may, without offence, be permitted to smile, was recently made by a French *savant* of some repute, who applied to me for information regarding certain alleged species of Tussur moths, known in India as *Antheræa Teriah, Anth. Dabrah, Anth. Mooga*, and several more, these being, not the names of insects, but technical terms applied by the native cultivators of Beerbhoom to particular qualities of cocoons of *Antheræa Paphia*, which are assorted according to size, colour, &c., under these various titles.

It would appear that while one school is labouring hard to prove that all organized beings are the descendants of "one primordial type," others are equally bent on proving that each species is *sui generis*, and entitled to stand alone.

7. BOMBYX HUTTONI, Westw.

Syn. *Bombyx Huttoni*, Westwood, Cab. Or Ent. pl. 12, f. 4.
Theophila Huttoni, Moore, Trans. Ent. Soc. Lond., 3rd Series, i. 314, 315.

This species, which feeds on the wild indigenous mulberry tree of the North Western Himalaya, is apparently confined to the mountains, from the neighbourhood of Dehra, at about 2,000 feet of elevation up to 7,000 and even 8,000 feet. It does not appear to occur in Nipal, but ranges westward from about Kemaon. This worm is double-brooded, and yields two crops of silk in the year; this is of the very best quality, but unfortunately the worm is so erratic and intractable, that hitherto all attempts to domesticate it have proved abortive; it will not remain in the feeding trays, like the Chinese worms, but wanders away until the brood is lost. The only method of rearing it is to leave it at full liberty on the trees, where it remains perfectly quiet and contented, but has so many enemies to contend with, in the shape of birds, flies, bugs and wasps, as to render a crop of silk very precarious and almost unattainable, without constant watching and expense, which renders the crop unprofitable.

As previously stated, I discovered this species at Simla in the autumn of 1837, on the wild forest mulberry, and again after the campaign in Afghanistan, at Mussooree in 1842, at which time I sent it to Mr. Westwood. in England

The wild mulberry-tree of the North Western Himalaya usually comes into leaf about the first week in March, but of course this is in a great measure dependent upon the situation, elevation and temperature of the season.

The eggs of this silkworm are firmly attached to the bark of the tree, sometimes on the trunk, but more generally on the underside of the branches, where they remain spread out in clusters and exposed all the winter to the action of the frost, but where they are at the same time protected from the rain and snow, so as to run no risk of being washed off by the dissolving of their agglutinating gum.

The colour of the egg is a pale straw-yellow, which, unlike the eggs of the Chinese races, is retained to the last. The egg is considerably larger than those of *B. Mori.* The young worm is disclosed from the egg a few days after the opening of the leaf-buds; the hatching is however, very irregular and continues sometimes even up to the end of April, although this is generally dependent upon the situation of the tree.

In some seasons these worms are so numerous that the trees are completely denuded of every leaf by the middle of May, and in such cases the worms, after gnawing off all the leaves which envelope the cocoons already formed, are compelled to descend from the tree and spin among the leaves of the neighbouring shrubs and bushes, while many that are still immature necessarily die of hunger, or fall a prey to birds. The trees that have been thus denuded speedily put forth fresh leaves, to be in due time consumed by the autumnal brood. Trees thus stripped in the middle of May will be again in full foliage by the end of the first week in June.

It is curious to observe the instinctive knowledge which these worms appear to possess of the approach of a hail-storm; no sooner are peals of thunder heard, than the whole brood seems to regard them as a warning trumpet-call, and all are instantly in motion seeking shelter beneath the thicker branches, and even descending the trunk of the tree to some little distance, but never proceeding so low down as to lose the protecting shelter of the boughs. For rain they care nothing, but appear to be able to distinguish between the coming of a heavy shower, and the more pitiless pelting of the hail.

When the caterpillar is newly hatched its appearence, as seen under a good lens, is as follows:—Head and pro-legs shinning jet black; body dark brown, approaching to black; the first segment whitish-ash, the fourth pale rufous, as are the anal feet; tubercles disposed in longitudinal rows, giving forth short tufts of hair; a small anal tubercle on the penultimate segment: thus far there is scarcely a difference between it and the young Chinese worm. Length fully ⅛ of an inch: strong and robust, as compared with the best domestic stock. In the course of a day or two, the four anterior segments become greatly swollen and of a faint livid cream-colour, the dorsal portion being mottled or dotted with deep brown; the orange or rufous colour of the fourth segment somewhat deeper.

About the fourth day, the fourth anterior segments become swollen up very remarkably into a globular form, the dark spots being apparently beneath the skin; the rest of the body dark brown, with here and there a tinge of dull yellowish. On the fifth day they prepare to moult. After the first moult, the second and third segments form a globular ball, apparently out of all proportion to the rest of the body; the general ground colour becomes creamy-white, with the fourth segment yellow, the second and third being dotted above with dull leaden-grey; the remainder closely marbled over, or variegated without any definite arrangement, with black, grey, orange, ash and yellow blending like tortoise-shell; the fleshy tubercles or spines, short, conical and brown; skin smooth

In the subsequent stages, the general appearance remains the same, except that the spines are long and taper to a point, being fleshy at the base, but becoming somewhat horny towards the summits; all bend backwards in a curve except the central one on the penultimate segment, which lies down horizontally and points forward

When mature the ground colour becomes yellowish-white beautifully and closely marbled over with orange, dark ash-grey, leaden blue and brown; the second and third segments swollen into a large globose mass; the anterior segment creamy-yellow, which colour extends backwards on each side in a broad band through the sixth segment. This resembles the ashy band apparent in the worm of *B. Mori*, after reversion to its natural dark hue. There are two dorsal rows of long, black, slender and sharp-pointed spines commencing with the fifth segment, their base being orange-brown, and the four anterior segments being without them, as in *Attacus Atlas;* on the anal shield are four somewhat conical orange-brown rudimentary tubercles, and rows of small ones along the sides; the dorsal portion of the four anterior segments clouded or blotched with dull leaden-grey markings, apparently showing from beneath the skin; on the third segment are two brown spots or ocelli, marked within with several minute irregular dots of bluish-white; on the front of the second segment are two similar round spots, having a narrow edge and central dot of bluish-white; there are likewise several black spots both before and behind these ocelli; on the fifth segment are two irregular-shaped jet-black spots dotted with bluish white, and from the centre of these springs the first pair of dorsal spines, which are altogether black: head mottled brown and grey.

It is, however, almost impossible accurately and minutely to describe the distribution and blending of the various colours with which the insect is ornamented.

The cocoon is spun within the leaf from the beginning of May to the end of that month, according to the time of hatching, but I have sometimes taken cocoons as early as the 15th of April and again in September.

The figure of the moth, as represented on pl 12 of Westwood's Cabinet of Oriental Entomology, is, in several respects, very faulty, owing to the specimen sent to him having been injured during its long journey.

Expanse of wing in the male $1\frac{3}{4}$ inch; of females in general $2\frac{3}{16}$ inches. A black transverse band crosses the upper part of the abdomen at the waist, the posterior edge of which is bordered by a narrow line of ash; on the reflected abdominal margin of the hinder wings are two white spots; all the markings on the wings are of the same character as those upon the wings of *B. Mori*, but are far better defined and more intense than those in Westwood's figure. On the hinder wings the sub-marginal line is ash-coloured, as is also that on the upper wing. The plumes of the antennæ are likewise much longer than in the figure, which, taking it all in all, is very inaccurate.

In order if possible to reclaim this species and reduce it to a state of domestication, I succeeded in 1849 in obtaining a reciprocal cross between it and the Cashmere worm. In this experiment the female wild moth was coupled with the male *B. Mori*, and the female *B. Mori* with the male *B. Huttoni;* the coupling of the latter was effected with the greatest difficulty, and the few eggs obtained were all unprolific; this always proved to be the case in repeated trials. With regard to the other attempt, the difficulty was not so great, the domestic males eagerly sought the wild females; the latter, however, exhibited an unmistakable dislike of such pigmy sweethearts, though a few coupled and deposited eggs. Still very few of these were prolific, and the caterpillars produced from them retained all the intractable habits of the wild stock, and were accordingly placed upon the trees, where in due time they spun their cocoons. But neither in the caterpillar nor in the cocoon was there any perceptible difference from the wild race, and although some of these females were again crossed by hybrid males, the progeny was still to all intents and purposes as decidedly *B Huttoni* as at first.

From the refusal of the wild males to couple, and from the great difficulty experienced in inducing the females to allow the domestic males to approach, it may be said that a generic division would be justifiable; yet a certain coupling did take place and the progeny was fertile, although the strength and health of the wild race completely outweighed the influence of the degenerated domestic stock.

It was with a view to the eventual cultivation of the silk of this species that, after a lengthened correspondence, the Government of India in 1858 consented to the formation of a mulberry plantation at Mussooree under my superintendence, but having fully satisfied myself in the course of the second year, that from the intractable nature of the worm it would be impossible to domesticate it, the Government was only too glad to foreclose the experiment, while I having purchased the only tract of land suitable and available for the experiment, was left to "pay the piper" on the plea that the purchase had never been ordered !

8. Bombyx Bengalensis, Hutton.

The Wild Bengal Silkworm. (Pl. XIX. fig. 5.)

This species has apparently become exceedingly rare, if not extinct, in the neighbourhood of Calcutta, where it feeds on the *Artocarpus lacoocha*, and was discovered some years ago by the late W. Frith, Esq., of Calcutta, who showed me specimens of the moth in 1849, but stated that the worm fed on the mulberry tree and was not uncommon about Moorshedabad. The moth, however, which he then showed me was totally unlike one presented by Mr. A. Grote, being larger and of a brown colour. Can there be an undescribed species at Moorshedabad ?

Of *B. Bengalensis* I have never been able to procure the eggs, although Mr. Grote has interested himself in the matter; he now reports that for the last year or two the species has disappeared. It is probable, however, that it might still be procurable in other parts of Bengal where the bread-fruit tree flourishes. From a well-executed coloured drawing of the larva, furnished through the kindness of this gentleman, I am enabled to record its appearance as follows :—Head brown ; from the head to the middle of the sixth segment ashy white or cream colour ; the second and third segments wrinkled and slightly intumescent, bearing a few small rufous spots ; prolegs rufous brown, with blackish tips ; from the middle of the sixth segment to the anal feet pale rufous-brown, each segment dotted with black ; stigmata oval white rings, with a black centre ; on the dorsal portion of the fifth segment are two slightly raised round black spots, from the centre of which radiate narrow white stripes, and from which rise the first or anterior pair of dorsal spines, which are wholly black ; on the eighth segment are two similar spots of a rufous-red colour with white rays, and bearing two black spines ; all the other segments bear black dorsal spines, with rufous bases ; the spine on the centre of the penultimate segment very large and strong, thick at the base or lower half, and becoming suddenly attenuated and falcate, pointing backwards, the tip only black, the rest pale rufous ; the dorsal spines are represented as standing erect. Legs rufous-brown, each bearing a pointed whitish stripe down its centre. The four anterior segments smooth and without spines. In point of size it appears to be far inferior to the larva of *B. Huttoni;* the four anterior segments make no approach to the globular mass which characterises that part in the Himalayan species, neither does it at all resemble it in the colouring.

The moth as furnished by Mr. Grote is of an ashy-white, and the cocoon that of a true *Bombyx.*

9. BOMBYX SUBNOTATA, Walker.

Syn. *Bombyx subnotata*, Walker, Proc. Linn. Soc Lond. iii.
Zool. p. 188 (1859).

Of this species nothing more appears to be known than is contained in Mr. Walker's description of the moth (*ubi supra*), and that it was procured from Singapore by Mr. A R. Wallace; neither the larva nor its food are mentioned.

In the absence of all information regarding the caterpillar, whether it is spined, like the two preceding, or smooth, as in the Chinese stock, it is impossible to decide upon the propriety of placing this species in the proposed new genus *Theophila.*

10. BOMBYX HORSFIELDI, Moore.

Syn. *Bombyx Horsfieldi*, Moore, Cat. Ind Mus. ii. pl. xi. a,
fig. 5.

This is not a Continental species and is merely inserted here to complete the series; the moth is described and figured in the Catalogue of the India Museum, but here again we know nothing of the larva, cocoon or food

Its habitat is Java.

11. BOMBYX SHERWILLI, Moore, MS.

Syn. *Bombyx Sherwilli*, Moore, *in epistolâ.*

Of this again the larva is unknown, and indeed the habitat is doubtful too. According to Mr. F. Moore the specimen was obtained from a collection said to have been made in the S. E. Himalayas by the late Major J L. Sherwill; but Entomologists who have long collected in that quarter, assure me that they have never seen a specimen of *Bombyx* from thence. Nevertheless, this is but negative evidence; and if once a specimen has been obtained others may probably follow. According to Mr. Moore it is "allied to *B. Huttoni*, and differs from it in being somewhat larger, and of a greyer colour, the forewing having the apical patch fuliginous instead of black, and it has only a single transverse discal streak (instead of the two, as in *B. Huttoni*). A most prominent character is that the abdomen is tipt with black, as well as having the dark ashy waistband."

Large light-coloured specimens are sometimes seen of *B. Huttoni*, but I do not remember ever to have seen the abdomen tipt with black.

12. BOMBYX RELIGIOSÆ, Helfer.

Syn. *Bombyx religiosæ*, Helfer J. A. S. Beng. vi. p. 41.
Bombyx Huttoni, apud Moore, Cat. Ind. Mus.
The Joree Silkworm Moth, Helfer.
The Deo-mooga Silkworm, Hugon, J. A. S. Beng. vi. pp. 32, 41.
Habitat Assam, Sylhet.

Of this species, notwithstanding the number of years that have elapsed since its discovery, and my repeated efforts to obtain it through the assistance of gentlemen resident in Assam, nothing more appears to be known than what Dr. Helfer recorded in 1837. It is said to be somewhat rare, but this I suspect is rather to be attributed to the want of research than to any actual scarcity, since the insect appears to have been in considerable abundance on the trees at the time when its discovery was made

The larva of *B. religiosæ* is said to feed on the leaves of the Peepul tree or *Ficus religiosa*, and for want of more recent information I must content myself with the account furnished by Dr. Helfer *(ubi sub.)*, calling attention to the fact of the worm bearing two names,—" *The Joree*" and " *The Deo-mooga*" silkworm, whence, together with one or two other circumstances to be pointed out, I am inclined to think there are two species united under this name, and that neither of them belongs to the genus *Bombyx*.

It is to be observed that the species was discovered in Cachar by Mr Hugon in 1834, and he describes the worm as being active, *very slender in proportion to its length*, scarcely 2½ inches long, of a reddish colour, and glazed, or shining. The moth, he says, is " very much like that of the mulberry ; so is the cocoon also in appearance, colour and size."

Now, in describing the worm, there is not the least allusion to the slender semi-horny spines which are so remarkable both in *B. Huttoni* and *B. Bengalensis*, while the slender glazed form is again unlike those species, and seems to approach more closely to genus *Ocinara*.

In regard to the cocoon, while Mr. Hugon declares it to be very like that of the mulberry worm, "in appearance, colour and size," Dr. Helfer, on the other hand, declares it to be " very different from the cocoon of the mulberry moth."

It is to be remembered, however, that Mr. Hugon spoke of an insect which he discovered in Cachar, while Dr. Helfer describes one discovered by Major Jenkins in Assam, where "it yields a silk, if not superior, yet certainly equal, to that of *B. Mori*, [? *B. textor* or *B. Crœsi*, probably]. The cocoon shows the finest filament, and has very much silky lustre. It is exceedingly smooth to the touch, and very different from the cocoon of the mulberry moth. The worm lives on the Peepul-tree (*Ficus religiosa*)."

It seems to have been entirely overlooked that Mr. Hugon in Cachar found his worms on "the Bur-tree (*Ficus Indica*)," and that "in appearance, colour and size," they were very like the mulberry worm; while Major Jenkins in Assam found his, on an allied, but still a different tree, "the Peepul (*Ficus religiosa*)," and the cocoon was "very different from that of the mulberry moth." Is it not quite possible that there may be two distinct species, the Deo-mooga of Cachar, and the Joree of Assam?

What renders the uncertainty still greater is the fact that Mr Hugon himself "was unable to determine whether the Joree and Deo-mooga were the same, and was inclined, from the colour of the cocoons and the slight observations he was able to make on the latter, to think them distinct." My own opinion, judging from what has been advanced, and from the fact that the cocoons are said to be less even than those of the Dasee (*B. fortunatus*), is, that neither the one nor the other belongs to *Bombyx*. but will be found to be species of the allied genus *Ocinara*, an opinion supported in some measure by the nature of the food, these insects feeding on two species of *Ficus*, just as our two mountain species at Mussooree are confined to the *Ficus venosa*.

Genus OCINARA, Walker.

The insects of this genus, although in some respects allied to *Bombyx*, show likewise, in the larva state, a strong approach to the *Geometræ*, being characterized by knotty and dry bud-like excrescences, which, with the rigid attitude assumed when at rest, give the insect the appearance of a withered twig or piece of dry stick. In those discovered at Mussooree the larvæ appear to be almost entirely night feeders, seldom moving during the day from the position they have taken up, which is usually at the end of a thin twig, along which they lie stretched out immovable, and to which they are so much assimilated, both in colour and ruggedness of appearance, as easily to pass unnoticed.

1. OCINARA MOOREI, Hutton.

The larva of this species feeds on the *Ficus venosa*, and is found at Mussooree at an elevation of about 5,400 feet; it spins a small white silken cocoon on the inner surface of the leaf or even, should it fall from the tree, under a tile or stone, or against a flower-pot. There are certainly two broods during the summer months, and I suspect as many as three or four.

The larva is of an earthy-brown colour, and covered with short hairs; it has a raised transverse ridge across the second segment, in front of which is a blackish patch; it has a very short truncated spine on the middle of the penultimate segment, which usually lies down pointing backwards, and even with the plain of the back; it is, however, capable of being raised into an erect position when the insect is disturbed. The general appearance is rough and bark-like, and the ventral line is thickly fringed, as are the feet also, with rather long hairs.

The moth, judging from the description given by Mr. Moore of his species *O. Lida*, appears closely allied to it, and were it not that he makes no mention of the three black spots on the abdominal margin of the lower wings, of a black dot on the disc beneath, and gives palpi ferruginous instead of dusky black, I should have been strongly tempted to consider them as identical.

The wings in both sexes are of a creamy white, partially suffused with a faint ferruginous tinge; an indistinct undulating submarginal line bearing a ferruginous mark on each nervure, the largest being on the costal margin; abdominal and outer edges of the wings well fringed with long cilia, forming well-marked border; an indistinct subbasal wavy line with one or two indistinct ferruginous dots on the nervures; on the hinder wing is a wavy, very indistinct pale-brown band at about one-third from the margin, the fringe of the lower wings terminates in a projecting square patch, caused by the turning down or folding of the remaining portion of the abdominal margin, on which are three ferruginous dots. Body tricarinated, or having a dorsal and a lateral line on each side composed of tufts of long scales of a triangular form, and appearing like a projecting serrated line; colour very faint ferruginous, or sandy brown, very little darker than the wings. Antennæ bipectinated and faintly tinged with ferruginous; thorax, and forehead between the eyes, white eyes, palpi, and inner side of forelegs, dusky black; under side ashy white, the wavy brown bands and spots well defined, and there is a black dot on the disc of the lower wings; body beneath whitish. Expanse of wing in the male 1½ inch, in the female 2 inches.

The silk of this species is fine and elastic; the cocoon oval, flattened beneath where in contact with the leaf, convex above; it is enveloped in a light screen of floss silk, spread over it in curls, and not web-like as in *Bombyx*. The cocoon is too small to become valuable. I have taken cocoons both in May and in August. The larva is usually found stretched along a thin branch, to which it clings very closely, and is scarcely distinguishable from the wood.

2. OCINARA LACTEA, Hutton.

The larva of this species feeds likewise upon the *Ficus Venosa*, at the same place and elevation as the last, and is often found with it on the same tree. It appears to be a far more abundant species than the former, and is usually found stretched along the extreme end of a twig and so close that it appears to be part and parcel of the branch; at other times it will be found obliquely erect and stiff so as to resemble a dry stick. When very young, it resorts also to the edges and the back of the leaf. It is without hairs, and quite naked. The young worm is of a pale-yellowish green, resembling the leaf-stalk upon which it rests; on the back of the second segment is a slightly raised transverse ridge tinged with brown, and on the fifth and ninth segments are two slightly-raised round tubercles of the same colour; an anal horn, on the penultimate segment, which is also light brown. When adult, the colour changes to a russet brown like the bark of the tree, and the transverse ridge and tubercles become well developed and somewhat darker than the rest of the body; the anal horn or spine generally appears as if truncated by the loss of the summit,—yet such is not the case, as the extremity is retractile, and is generally withdrawn into the lower part as a sheath; when the animal is about to moult, or is disturbed and irritated, the summit of this spine is exserted, and instead of being brown, like the base, is whitish; when exserted the whole stands erect, slightly inclining backwards. It would be a difficult task to explain the use of this curious contrivance, and I have been hitherto unable to detect anything that could lead me even to conjecture what purpose it can possibly serve.

The shape of the larva is similiar to that of *O. dilectula*, as figured in the second volume of the Lepidopterous Insects in the Indian Museum, except that in the figure of the latter there are no raised tubercles.

From the larva of the preceding species, it differs both in shape and habits In *O. lactea* the entire form and appearance are those of a *Geometra*, but it nevertheless progresses in the usual way like the larva of *Bombyx*. In its manner of stretching from the twig to an adjacent leaf while feeding, and in its habit, when at rest, of folding the prolegs together and obliquely raising all the anterior segments of the body, as far back as the sixth, off the surface of the twig or leaf, and at an acute angle with the plane upon which it stands, it very strongly resembles a *Geometra*, and gives one the idea of its forming a connecting link between that curious genus and the *Bombyces*. It feeds principally at night like the last, and in its younger stages is usually found at the extreme end of a young leafy twig, the terminal bud of which it strongly resembles. It spins a small compact cocoon, shaped like that of last, but of a sulphur-yellow colour instead of white, and the flossy web which covers it is more closely woven into a kind of network, with regular open circular meshes. The eggs are at first of a very pale straw yellow, and are deposited in short lines of three to eight in each; after a time a red dot appears in the centre of the egg, and then, in a day or two more, the entire egg changes to a dark stone-grey, and the young worm speedily emerges.

The moth is small and white, often with the wings partially hyaline and iridescent, though this, I am inclined to think, arises from the abrasion of the scales, which are very loose and easily rubbed off. The upper wing has an indistinct and nearly obsolete submarginal and slightly undulating double line, with a minute black dot on each nervure, and a larger one on the costal margin flanked on each side by a smaller one. About the middle of the costal margin, at a little distance within the wing, is a black spot formed by two short parallel lines close together, and an almost obsolete double-curved line near the basal angle, running from the anterior to the posterior margin; both the wings are rounded externally. The lower wing has also an obscure brownish submarginal line without dots; a small black dot on the disc, which however is not always present, and three well-defined black spots on the fringe of the abdominal margin, which as in the foregoing species, is folded down. The under-side is dull white, with the discal spots and submarginal lines more clearly developed than above. Eyes and palpi black; antennæ with white shafts and ferruginous plumes: body densely clothed with long hair-like scales; upper surface of body smoky ash-grey; thorax and forehead between the eyes white.

Throughout July and August the larvæ of this species are abundant at an elevation of 5,400 feet on the *Ficus venosa*, which the natives term "*Doodli*," from the milky nature of its juices which exude freely when a leaf is plucked. In the female of this moth, there is a dorsal keel, serrated, and composed of long scales. Expanse of female $1\frac{6}{10}$ inch, of male $1\frac{3}{10}$ inch.

3. OCINARA COMMA, Hutton.

This occurs in the Dehra Doon at the foot of the mountains, where the moth is said to be usually found on the Mango tree; but it has not yet been ascertained whether the larva feeds upon its leaves or not.

The moth is white, both in wings and body, with a single comma-like black mark about the centre of the anterior margin of the upper wing and at a little distance from the margin; under-side also white, with the comma mark a little less distinct, and on the centre of the hinder wing is a very faint indication of a black spot; antennæ bipectinate, the shaft white, with faint ferruginous plumes; the face and palpi dull yellowish; the two anterior pairs of legs each bearing two black spots on the outer edge; expanse of a wing in a female $1\frac{9}{10}$ inch. Appears in July and August.

Besides these, I am informed that other Continental species have been captured at Darjilling, but to these at present I have no access.

There are likewise two species from Java, noticed by Mr. Moore in the second volume of the Lepidoptera contained in the India Museum. These are—

4. OCINARA DILECTULA, Walker.

Syn. *Ocinara dilectula*, Walker, List Lep. Het. Brit. Mus. pt. vii.
p. 1768 (1856); Moore, Catal. Lep. Ind.
Mus. ii. p. 381.

Habitat Java, where procured by the late Dr Horsfield. Like the species at Mussooree it is said to "feed upon a species of *Ficus*, bearing the native name of *Weringin*" This circumstance seems to point out the species of *Ficus* as the natural food of the genus, and makes me still more inclined to regard the *Bombyx religiosæ* as belonging in reality to *Ocinara.*

5. OCINARA LIDA, Moore.

Syn. *Ocinara Lida*, Moore, Cat. Lep Ind. Mus. ii. p. 381.

This is likewise a Javanese species discovered by Dr. Horsfield, but nothing is recorded of the larva or its food The moth is described in the above-named publication, and appears to be closely allied to my *O. Moorei.*

Genus TRILOCHA, Moore.

1. TRILOCHA VARIANS, Moore. (Pl. XIX. fig. 1, ♂ fig. 2. ♀).

Syn. *Trilocha varians*, Moore, Cat. Lep. Ind: Mus. ii. p. 382.
Naprepa varians, Walker, List. Lep. Het. Brit. Mus. pt.
p. 1153 (1855.)

This species which is figured in vol. ii. of the Catalogue of Lepidoptera in the India Museum, is said to have been presented by J. N. Ward, Esq., from Canara, but nothing more is recorded; the figure given by Mr. Moore (*ubi sup.*) looks wonderfully like an *Ocinara*.

NOTE.—The larvæ here figured (Pl. XIX. figs. 1, 2), which I believe to be those of the male and female (the moths of both being also figured in the original drawings from which these are copied) were discoverd in the neighbourhood of Calcutta, by Mr. Grote by whom they were kindly forwarded to me. They were found in February and March, feeding on *Trophis aspera*, other larvæ being also taken on *Ficus indica* and *F. religiosa*. Spins a small yellowish-white cocoon, within the leaf or naked. Drawings of the same insect in all its stages were made by Mr. Walter Elliot during his residence in Madras, the larvæ there also being found on *Ficus religiosa.*—F. MOORE, February, 1865.

PROGRESS OF COTTON CULTURE IN EGYPT.

FROM no other available source of cotton supply can we now obtain cotton of such good quality as that grown in Egypt. It has a fineness and strength which make it suitable for the best goods, and a length of staple adapted to the machinery now in use in the Lancashire cotton-mills. It has borne a high price since the stoppage of shipments from America, but it is found that we can now depend upon large quantities of Egyptian cotton at prices at which it is doubtful if the American planters will for a long time be able to compete. The Egyptians have shown an energy and thoroughly commercial enterprise in dealing with their golden opportunity, even beyond what might have been expected from a people far more advanced in modern civilization. They have drained and irrigated and planted, they have encouraged the construction of railways, and every work of public improvement, and they are now availing themselves of every mechanical means which European ingenuity has placed at their disposal for the cultivation of cotton. It is extraordinary how large are the orders already executed, and still in course of execution, for steam engines, centrifugal pumps, steam-plows, and cotton-gins, for the Egyptian cotton farms. There are now upwards of two hundred steam-plows at work in Egypt; the number of steam-pumps is probably still greater, and the cotton-gins are countless; there being several towns and villages having from twenty to thirty ginning factories each. The Viceroy has 150,000 fodans, or acres, of land under cultivation with cotton; his uncle, Haleem Pasha, who has sixty steam engines and fourteen steam-plows at work, is cultivating 50,000 acres, and others of lower rank, or of no rank at all, are, in the aggregate, working a still larger acreage. The cotton plant is most productive in Egypt, and although the proportion of cleaned lint to seed cotton is considerably lower than in the case of American cotton, some of the irrigated lands of Egypt have produced as much as 900 lbs. of clean cotton per acre in one year, a quantity which is tenfold greater than the average yield of cotton fields in India. The Egyptian cotton lands pay an annual tax of 1*l.* per acre to Government, and their ordinary rental is 5*l.* per acre. These are charges quite beyond anything known to the American planters of former days, but they are in part compensated for by the greater yield and superior quality of the Egyptian staple, and by the aid derived from steam. In no country in the world is cotton again likely to be grown by slave labour, and hence, whatever the effect upon the future price of the article, the greatest advantage enjoyed by the American planter is gone for ever. Whether he will now avail himself, as the Egyptians have done, of steam machinery, or the next best resource, remains to be seen; it is, of course, for the interest of this country that he should. We cannot have too many or too abundant source of supply. But with the exception, perhaps, of America, the cotton-grown countries cannot do without British machinery, and the result in Egypt shows what the demand upon our engineers is likely to become. We have not yet reached, if it be indeed possible that we shall in this century ever reach, our maximum production of cotton goods, for the demand is constantly increasing, and every spindle manufactured corresponds but to the natural increase of the means of supply.

English engineers when abroad are often struck by the adaptability shown by people of inferior civilization in the management of machinery. On many of the Egyptian cotton farms, the Engine-drivers, firemen, and even those entrusted with the repairs of the engines, are Arabs. As for repairs, it has not yet apparently occurred to the Egyptian mind that they are requisite. In many cases, as soon as a fire-box is burnt out, or a cylinder scratched so as to defy the care of the driver in adjusting his packing, the engine is practically condemned, being left out in the weather, and a new one ordered, we will say from England. This may not seem a matter of regret here—although even those who thus obtain orders which ought not to have been given, must know that it is for their own interest, in the long run, that their customers should be careful, economical people, as if they are not they cannot go on for ever ordering machinery and paying their debts. But it is likely that engine-mending, like engine-driving, will yet be learned by the Arabs.—'Engineer.'

Correspondence and Selections.

THE PRACTICE OF IN-BREEDING.

To DR. THOS. BLACK, CINTRA, ST. KILDA.

DEAR SIR,—I have much pleasure in complying with your request that I would state my reasons for deprecating the course of breeding recommended to the Acclimatisation Society in the case of the Angora goats.

That course was to cross the pure Angora blood at every fourth or fifth generation with that of the common goat. The reason assigned for the recommendation was, that the cross is required to prevent the degeneracy necessarily caused by in-breeding.

The injury to the valuable characteristics of the pure blood is not denied; but it is alleged to be expedient to submit to a lesser evil as the only possible means of escaping a greater; and it is thought possi[illegible], easy—to remedy the mischief done by the cross of inferior blood, by breeding back again to the superior.

But if I can prove to you, by numerous examples, that pure breeds suffer no deterioration by being confined within their own blood for any length of time, then you cannot hesitate to admit that crossing is unnecessary. And if it be unnecessary the impropriety of introducing inferior blood is undeniable. And if I can further show that it is not only much more difficult to get rid of the evil effects of base blood upon the valuable characteristics of the pure than is commonly supposed, but that it is absolutely impossible ever entirely to obliterate them; then the impropriety of using base blood at all is brought out in still stronger relief.

I shall now mention a few of the numerous cases in which blood has been kept pure for many generations without any deterioration. And it will be seen in the notices of them to which I shall refer, that in many instances in which attempts have been made to improve a perfectly pure family, by a fresh infusion of blood from another family, equally pure, and even in some respects superior, the result has been injury instead of improvement. This affords decisive proof that heterogeneousness *(differentness)* of blood is, of itself, injurious, even irrespective of the intrinsic quality of the blood infused.

1. The aboriginal cattle of Great Britain have been confined in the Duke of Hamilton's park at Chatelherault for centuries, without admixture of blood, yet without exhibiting the slightest sign of degeneracy.

2. The same herd has been confined in the park at Chillingham Castle with the same results. (See "Youatt," p. 8, for both cases.) This herd at one time, was "reduced by an epidemic to one cow in calf; the produce was a bull; and from these two have descended, without the infusion of any fresh blood, the whole of the present herd." (See Mr. Storer's letter to the *Mark Lane Express.*)

3. The North Devon herd of cattle is a pure branch of the aboriginal race in a state of domestication. It has been brought to its present high state of excellence by selection within its own blood alone. (See "Youatt," p. 16.) All attempts to improve it by crossing have been proved abortive. (See "Youatt," pp. 16, 21)

4. The West Highland cattle present a most striking and instructive instance of the truth under consideration. Essentially a part of the great aboriginal race, they have existed in the Hebrides for ages in perfect purity. Their food consisted principally of seaweed, heather, and rushes. Although exposed to the rigours of an Hebridean winter, without artificial food or shelter, they have increased and multiplied. They are eminent, beyond all other cattle, for hardiness and strength of constitution, yet they have been uncrossed for centuries. It has been found easy to effect improvement by selection within the limits of the pure blood. But all endeavours to effect improvements by the use of fresh blood have resulted in manifest injury. At p. 69, Youatt says, that "the Hebridean farmer appeals to his uniform experience, that attempts at crossing have only destroyed the symmetry of the Kyloes, and rendered them more delicate and unsuited to the climate and pasture."

5. The Galloway cattle form another branch of the pure aboriginal family. The perfect purity of the race is unquestioned. Of them, at p. 163, Youatt says,—"The intelligent Galloway farmer is now perfectly satisfied that his stock can only be improved by adherence to the pure breed, and by care in the selection." All attempts to improve them by the use even of the choicest Southern bulls have resulted in manifest failure

6. M. Sanson, in a paper read before the Academy of Sciences in Paris, stated that the Breton breed of cattle of the department of the Morbihan, *remarkable for its vigour of constitution* and richness of milk,

has never been crossed, and is propagated by consanguinity (in-and-in breeding.)

7. Of the cross between the long and short-horns, both excellent when pure, Youatt says, at p. 202, "The first cross is excellent, but the produce is uncertain; and in the majority of cases, the third or fourth generation are long-horns again, but without the good qualities of the original stock. They are of diminished size, they are bad milkers, and will not graze kindly; in addition to which, there is much uncertainty whether the cows will hold to the bull Full one-third of the cows among these half-breds fail of being in calf."

8. The black-faced breed of sheep of the Highlands of Scotland is a pure aboriginal race. The improvements which have been made in the black-faced sheep have been mostly effected by judicious selection. The crosses have generally failed, even those with another excellent mountain sheep, the Cheviot. The advocates of both breeds acknowledge this. They confess that a "good sheep is never produced from their being crossed, but the offspring is always ugly and ill-shaped." "To effect a change in the old forest breed," says Mr. W. Hogg, "Cheviot rams were admitted to the hardy natives of the more elevated parts of the country. The independent habits of the mountain flocks were lost, and a mongrel progeny of a clumsy figure occupied the lowest and warmest of the pastures. *Although both of the parents were hardy, the issue of the two were easily subdued by the cold of winter.*" (See Youatt, pp. 282 and 283) Here we have a fact well worthy the attention of those who imagine that crossing imparts vigour, and that inbreeding produces degeneracy. We find two pure races, each hardy and excellent, exhibiting no symptom of deterioration, though the blood, in each separate race, has been homogeneous for ages. They are then crossed. The blood of each, though excellent in itself, is heterogeneous to (*other than*) the other. The result is degeneracy. The cause is clear. It is heterogeneousness alone. Numerous instances of a similar kind can be adduced.

9 A proof, precisely similar, is afforded by the Welsh sheep. The breed is aboriginal, and has been preserved in perfect purity in Merionethshire. It has been improved by selections of rams of the best pure blood, which is to be found at Tallyllyn, at the foot of Cader Idris They are proverbially hardy and well constitutioned. But attempts which have been made to improve the size of the breed by a cross of the black-faced Scotch, have produced degeneracy "Both one and the other seem to lose their original character, and the produce is inferior to both of the progenitors." (See Youatt, p. 276.)

10. Yet another is to be found in the Shetland sheep. The aboriginal breed has been kept perfectly pure for centuries. It is admirably hardy and capable of enduring the extremes of cold and privation. But an infusion of fresh blood, although in many respects intrinsically superior, has produced "a somewhat larger breed with an impaired fleece; but it does not thrive there; it is unable to bear the rigour of a northern winter, and often perishes from absolute cold or from privation."—(See Youatt, p. 298.)

11. Mr. Ellman effected great improvements in the original pure Southdowns by selection within their own blood, But all efforts to improve them by out-crossing resulted in failure.—(See Youatt, p 233.)

12. By far the most remarkable instance, however, of the preservation of a breed of domestic animals in perfect purity, is that of the Spanish Merino. It is remarkable on account of the length of time during which it is known to have existed in purity. This exceeds, by many centuries, the time during which any other domestic animal is positively known to have existed. And it is remarkable, on account of the authenticity and number of the sources of our information. The writings of Strabo, Solinus, Columella, and Pliny, who was himself the Roman Procurator in Spain, render it certain that the finest woolled race of sheep in the world existed, as a distinct breed, in Spain, anterior to the Christian era. (See Youatt, p. 145) The preservation of the breed in perfect purity for eighteen centuries, is attested by the history of the world ever since. The Spaniards not only guarded the purity of the blood with the most jealous care, but bred in-and-in to each particular family or cabana. (See Randell's Paper on "Fine Wool Husbandry," p. 4.) At page 72, he says: "The Spaniards carefully guarded against any mixture between their cabanas and they bred in-and-in for ages. At p, 96: "I am inclined to question whether the great cabanas of Spain, some of them once numbering 40,000 sheep would ever have acquired their remarkable identity of characteristics without that in-and-in breeding to which they were subjected." At p. 76: "It is by no means true that it is either unsafe or improper to interbreed animals of any degree of relationship. If it is, what has saved the Spanish canabas for ages?" As his authorities, he refers to Lasteyrie, Livingstone, and Jorvellanos, whose tunities for investigating were unusually good, and whose bility is unquestioned.

It seems almost a waste of time and words seriously to refute the assertion which has been lately reiterated, that the Merino is descended from the Cotswold. It has been refuted over and over again. Youatt says, p. 339. "They were long-woolled sheep that were sent to Spain, not designed to mingle with or improve the wool or the breed of the migratory sheep of Spain, but to form a lighter serge-like fabric. Stowe is in manifest error when he attributes any change in the breed of the Spanish sheep to the animals then exported." The reasoning on which the assertion is based (for no direct evidence exists), is eminently fallacious. We are told the well-known fact, that a few Cotswolds were sent to Spain in the fifteenth century, and that *therefore* the Merino is descended from the Cotswold. A more absolute *non sequitur* can scarcely be conceived. In other words, we are asked to accept as proof of the existence of a fact, that which merely renders it not impossible that the fact might have had existence. But we are in possession of a thousand positive proofs that it never did have existence. The presence, in Spain, of the Merino race, at the period of the Christian era, is established on evidence as strong and reliable as that of any fact recorded in profane history. And the continued preservation of the race in perfect purity, together with the important commercial effects which the manufacture of the wool exercised over the civilised world, are matters of history. The very name "Meses" of one of the great cabanas, is of itself sufficient proof of their existence under the Moorish dynasty, "this flock having been the property of the Moors before their expulsion from Spain."—(See Randall, p. 26.) And even had the Spanish national character been directly the reverse of that which it is well-known to be—had they been subject to those manias for crossing which, unfortunately, are so apt to seize on ignorant and inexperienced breeders, it would, even then, scarcely have been possible that the few sheep imported from England, and their descendants, could, in the time, and considering the geographical character of the country, have contaminated the blood of all the pure cabanas, many of which numbered over 40,000. But the extreme improbability, or rather impossibility of the idea, is rendered evident when the Spanish national character, and the Spanish views on breeding, are taken into account. The former is notoriously conservative and averse from all innovation. The latter we know to have been strongly in favour of in-breeding, and opposed to crossing even to the extent of different families of the same blood.—(See Randall, pp. 4, 5, 72, 76.) And at p. 24, he says: "With the Spanish ideas in respect to mixing cabanas, such a Spanish agent as he (Colonel Humphries) employed, would not have procured different varieties as the foundation of a flock."

With these facts before us, the idea that the Cotswold blood either was the origin of, or has been allowed to adulterate any of the great cabanas which the Spaniards pronounce pure, must be regarded as an utterly unsupported hypothesis; and as such, unworthy of further notice.

A sufficient number of proofs has now been given to render it certain, that crossing is not only not necessary to preserve any perfectly pure breed from degeneracy, but is positively detrimental to such a breed, even as regards hardiness and strength of constitution. And since it has been shown that injury to both has resulted from the intermixture of the blood of two good and pure families, it becomes evident that the element of heterogeneousness *(differentness)* is of itself injurious, irrespective of the intrinsic quality of the blood.

I shall now show, as proposed, by very convincing proofs, that to obliberate the evil effects of a cross of base blood, even by breeding steadily back to the pure strain, is not only not so easy as is commonly supposed, but is absolutely impossible in any length of time.

In some letters which I addressed to the *Economist* in 1863, I demonstrated, theoretically, the impossibility of ever obtaining perfect purity from blood containing any admixture of impurity. That dated 16th September, 1863, contains the following passage: "Although the original sire be pure, if the original dam be not pure also, the son and daughter will not be pure; and, of necessity, their progeny (as in the case supposed) will not be pure. Nay even were the daughter, instead of being put to her impure brother, be put to her pure sire, or any other pure sire, and her daughters, to endless generations put to pure sires to the end of time—startling as the assertion may at first sight appear—the stain, speaking with mathematical precision, could never be wholly washed away. For division is infinite. And as the asymptote progresses upon its curve, ever approaching, nearer and nearer, to all eternity, yet never coinciding; so does the stain of impurity for ever remain; diminishing, indeed, with every addition of pure blood, yet never completely annihilated."

When these lines were written, I had never even heard of Dr Randall. It is now satisfactory to find, in his paper, the most decisive proof of the perfect correspondence which exists between mathematical truth and practical results. Many breeders, who look upon their own experience with considerable respect, and who cannot, of course, deny the correctness of the theoretical abstraction, still think that practically as they call it, base blood can be bred out. The following facts are well worthy the attention of such breeders:

Dr. Randall, quoting from Fleichmann's report, states that "They (the Germans) found that their original coarse sheep had 5,500 fibres of wool on a square inch; grades of the third or fourth Merino cross produced about 8,000; the twentieth cross 27,000; the perfect pure blood 40,000 to 48,000."

Those are pregnant facts.

Randall's commentary on them is, "Where there is deficiency of capital to stock wool-growing farms with pure Merino sheep, or where the latter cannot be obtained rapidly enough, it is better to cross coarse ewes with Merino rams than to leave the land idle. In the progress of time the produce will become excellent and profitable sheep. But to suppose that the produce of the fourth, or of the twentieth cross will equal pure and properly bred Merinoes is what no breeder of ripe experience ever dreamed of. Base blood runs rapidly out by arithmetical calculations. But practically *it stays in* (the italics are Randall's), and is ever and anon cropping out, by exhibiting the old base characteristics, in a way that sets all "calculation" at defiance. The observing Germans have a very good way of terming all, even the very highest bred mongrels, simply "improved half blood."

The opinions of Randall are entitled to the very highest respect. No other writer on the principles of breeding has brought to the task so many of the qualifications necessary for the satisfactory performance of it. Endowed with a high order of literary talent, he has evidentally been born with a taste for the pursuit of breeding, which has been cultivated by a ripe and varied experimental knowledge of the subject. All these qualities are toned and tempered by perfect candour—freedom from prejudice—and an earnest and liberal-minded desire to assertain truth. It is, therefore, with great satisfaction—but no surprise—that I find that he regards and inculcates as true, those precise principles of breeding, which for years Mr. M'Dougall and myself have been endeavouring—not unsuccessfully—to impress upon the breeders of Victoria.

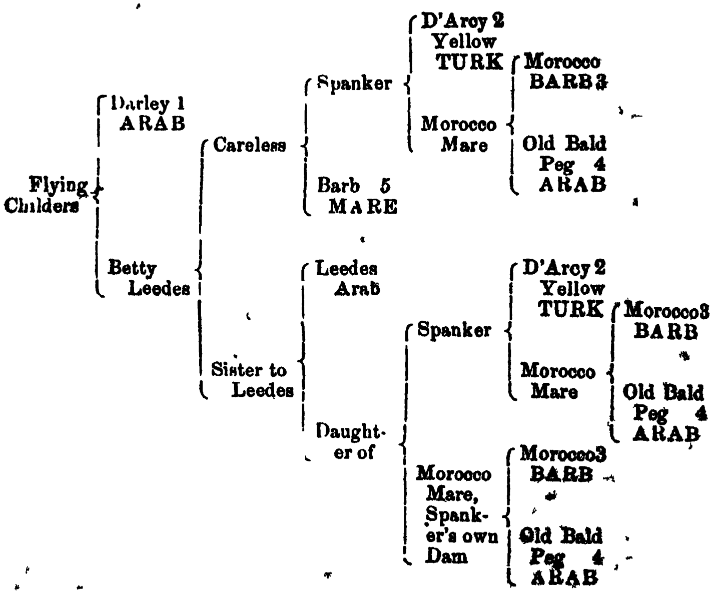
I have thus shown that crossing is unnecessary; and that the injurious effects of the presence of base blood can never be obliterated.

I will now go a step further, and mention a few of the many facts which could be brought forward to prove, that the very highest results which have ever been attained, amongst all kinds of domestic animals, have been effected by the closest in-breeding to perfectly pure blood, under favourable conditions.

1. The best original family of the horse of which we have any positive knowledge in past times, is the Arabian. The jealousy and suc-

cessful care with which the Arabs have ever guarded the purity of the blood is unquestionable. The Arab horse is, therefore, of necessity much in-bred, and the most excellent subvariety of the Arab—the English thoroughbred—was formed by close inbreeding to a very few individuals of the family. Moreover, all the horses which in their day were most celebrated for their performances, and which have stamped their impress most strongly on the race—Flying Childers, King Herod, Matchem, Eclipse, &c. &c.—have been those that were the most closely in-bred. (See Stud Book, Vol. 1.) This fact will be best illustrated by the annexed diagram of the pedigrees of Flying Childers. At the same time it must be stated that the pedigrees of Matchem, Herod, and many others, contain far more numerous cases of breeding between father and daughter, mother and son, and brother and sister; but they are too voluminous for insertion. From the pedigree of Childers it will be seen that his entire blood, in the first six generations was derived from only original individuals.

PEDIGREE OF FLYING CHILDERS.



A careful study of the Stud Book will fully sustain the correctness of the following observations, at p. 47 of Smith's valuable work on Breeding for the Turf: "When we revert to the pedigrees of our best racers, we shall find they were bred very close, many of them incestuously." At p. 50 of the same work, the author says: "I cannot take upon me to say how often an incestuous breed may be carried on before a degeneracy takes place, as I am not aware of that being the case in any instance, and experiment is in favour of breeding from son and mother, and father and daughter." At p. 55: "Having thus shown that our most valuable blood has been from son and mother, we shall find, upon examination, that that of father and daughter has been equally successful." Then follow numerous proofs. He then exhibits a large number of cases in which the produce of brother and sister have been proved to be superior to the produce of the same mares by less nearly related sires. See pp. 57 to 63. Numerous instances of a similar kind are stated by Stonehenge.

2. The best tribe of long-horn cattle ever bred was the Dishley herd, formed by Mr. Bakewell solely from one bull and two cows of pure blood. The closest possible inbreeding was practised by Bakewell, with the best possible results. (See Youatt, p. 190, *et seq.)* The annexed pedigree of the bull Shakespeare exhibits, at a glance, the truth of these statements, and it affords the best illustration of the means by which Bakewell—who stands *facile princeps* of all improving breeders—achieved those splendid successes which marked the dawn of the greatest era in the annals of breeding that the world has ever yet witnessed.

PEDIGREE OF SHAKESPEARE.

- **Shakespeare**
  - **D** .. ..
    - **Son of** .
      - **Twopenny**
        - **Westmoreland** BULL 1
        - **Old Comely CanleyHeifer No. 1** 2
      - **Canley Heifer No. 2** 3
    - **Daughter and Sister of**
      - **Twopenny**
        - **Westmoreland** BULL 1
        - **Old Comely CanleyHeirfer No. 1** 2
      - **Old Comely (Dam of Twopenny) Canley** 2 HEIFER **No. 1**
  - **Daughter of**
    - **Twopenny**
      - **Westmoreland** BULL 1
      - **Old Comely (Canley Heifer) No. 1** 2
    - **Canley Heifer No. 2** 3

From this it appears that the entire blood of Shakespeare, in four generations, was derived from only three distinct individuals.

Youatt says that Shakespeare was "the best stock-getter the long-horns ever possessed," that he "raised the long horns to a degree of perfection which, without so extraordinary a prodigy, they might never have reached," and that "it was remarked that every cow and heifer of the Shakespeare blood could be recognized at first sight as a descendant of his." The stock of this great bull, therefore affords proof that in-breeding confers, to an extraordinary extent, the power of "marking offspring," which is so valuable a characteristic in a sire; whilst the quality of stock he got, and the age to which he continued to cover—ten years old—amply suffice to prove that in-breeding does not, under favourable conditions, injure the constitution or the generative powers, but, on the contrary, produces a directly beneficial effect. We find a similar proof in the case of his sire D, who, being almost equally inbred, at the age of twelve or thirteen was more active than bulls usually are at four or five years old.

3. The best tribe of Herefords was formed by Mr. John Price, of Poole House, by inbreeding. Mr. Price states: "I have kept the blood of these cattle unadulterated for forty years, and Mr. Tomkins, of whom I bought them, assured me that he had bred the whole of his stock from two heifers and a bull selected by himself early in life, without any cross of blood. My herd of cattle has, therefore, been bred in-and-in as it is termed, for upwards of eighty years, and by far the greatest part of it in a direct line, on both sides, from one cow, now in calf for the twentieth time. I have bred three calves from her by two of her sons, one of which is now the largest cow I have, possessing also the best form and constitution. The other two were bulls, and proved of great value; thus showing indisputably that it is not requisite to mix the blood of the different kinds of the same race of animals to keep them from degenerating.

4. The best tribe of Devons has been produced by in-breeding (See "Youatt," pp. 15, 16, 21.)

5. All the tribes of short-horns are descended from a very few individuals of pure aboriginal blood. (See Storer's letter to *Mark Lane Express;* also, "Herd Book.")

6. The Bates tribe, which held the palm for many years, has been perpetuated by the closest in-breeding. (See ditto.)

7. The Booth tribe, which alone excels the Bates, has always been bred on the same system. (See ditto.)

8. The improved Leicesters were formed by Bakewell from a very

few individuals selected from the original pure blood. They have been perpetuated by the closest in-breeding to the descendants of these few individuals ever since. (See "Youatt," p. 314, *et seq.*)

9. The improved Southdowns were formed by Ellman by selection from the original pure blood, and perpetuated by in-breeding. (See "Youatt," p. 233.) The celebrated Jonas Webb, by a persistence in the system of selection, coupled with the very closest in-breeding, brought them to a still higher point of excellence

10. Mr Rutherford, upwards of half-a-century since, took some Cheviots to the north of Scotland. By inbreeding to the blood then obtained, he has produced the finest Cheviots in Scotland, in spite of the inferiority of pasture and climate with which he had to contend.

11. The French Merino (Rambouillet) was first formed from a selection of pure Spanish Merinoes, in 1786. A further selection was made in the ninth year of the Consulate. The flock has been bred within the blood of these two selections ever since. (See Baron Daurier's letter, date Rambouillet, 25th Dec., 1861.)

12. The Silesian Merino was formed in 1811, by Ferdinand Fisher, from four rams of the Negretti and one hundred ewes of the Infantado Cabanas. These and their descendants have been interbred ever since, without the addition of any other blood whatever. The character of this flock stands higher in America than that of any other German sheep. They are particularly noted for their hardiness and fertility. (See "Randall," pp. 60 and 70.) At p. 120 of the Practical Shepherd, Randall says, "Mr. Chamberlain's Silesians have not received any cross, or any fresh blood, from either of the original families within half a century, yet they are 50 per cent. larger than the sheep they originated from, and are entirely healthy."

13. The Attwood flock was formed in America by Stephen Attwood from one ram and one ewe of Col. Humphries' flock of pure Spanish Merinoes. In 1802, that gentleman imported seventy-five ewes and twenty-one rams of the Infantado Cabana direct from Spain to America. The descendants of these were carefully preserved from mixture with any other blood. Mr. Attwood never permitted any blood to mingle with that of his single ram and ewe, excepting that of Col. Humphries' flock, and confined himself then to rams of his own raising. After sixty years of the closest in-breeding these sheep are pronounced by Dr. Randall to be "low, compact, heavy, strong, hardy sheep." (See Randall, p. 50).

14. The American Paulars have been bred in-and-in since 1810, and are remarkable not only for quality but for hardiness to such an extent,

that Randall says of them that they are "*precisely the negligent farmers' sheep.* I have often seen a flock of them, slightly sheltered by a haystack, stand composedly chewing their cuds, and treading down the drifting snow under their feet, when the wild north-west gale curled up every other shivering animal on the farm."

15. The Hammond flock has been formed (also in America) by Mr. Edwin Hammond, by in-breeding to a few individuals of the pure Attwood blood. In eighteen years, by in-breeding and selection, with particular objects in view, this gentleman has completely changed some of the leading characteristics of these sheep. With reference to them, at p. 75, Randall says :—"Some of them seem to me to have reached the perfection of form in a fine-wooled sheep."

Subjoined is the pedigree of gold Drop, one of the best rams of the present day in America. In it is included that of the celebrated Sweepstakes, the ram figured in the frontispiece of Randall's Practical Shepherd. From it we find that the entire blood of Gold Drop in the seven generations was derived from only five distinct individuals.

PEDIGREE OF GOLD DROP.

- Gold Drop, 1861
  - California, 1860
    - Sweepstakes, 1856
      - Little Wrinkly 1835
        - Old Wrinkly, 1853
          - Old Greasy, 1850
            - Wooster, 1849
              - OLD BLACK, 1841 1
              - FIRST CHOICE OF EWE LAMBS 2
            - Dam of Old Greasy, 1847
              - OLD BLACK, 1841 1
              - FIRST CHOICE OF OLD EWES 3
          - Light Colored ewe 2nd, 1861
            - Old Greasy, by Wooster, by OLD BLACK 1 1850
            - Light Colored ewe 1st, 1848
              - OLD MATCHLESS 4 1841
              - DAM OF LIGHT COLORED EWE 5
        - Twin of Little Lawrence ewe, 1850
          - Wooster, by OLD BLACK 1 1849
          - FIRST CHOICE OF OLD EWES 3
      - Light Colored ewe 3rd, 1854
        - Old Greasy, by Wooster, by OLD BLACK 1 1850
        - Light Colored ewe 2nd, 1851
          - Old Greasy, by Wooster, by OLD BLACK 1 1850
          - Light Colored ewe 1st, 1848
            - OLD MATCHLESS 4 1841
            - DAM OF LIGHT COLORED EWE 5
    - Beauty 1st, 1857
      - Sweepstakes, by Little Wrinkly, by Old Greasy, by Wooster, by OLD BLACK 1 1856
      - Old Queen, 1854
        - Long Wool, 1853
          - Old Greasy, by Wooster, by OLD BLACK 1 1850
          - Lawrence ewe, 1851
            - Young Matchless, 1850
              - Wooster by OLD BLACK 1 1849
              - Light Colored ewe 1st, 1848
                - OLD MATCHLESS, 1841 4
                - DAM OF LIGHT COLORED EWES 5
            - First choice of ewe lambs
        - OldQueen's Dam, 1851
          - OLD BLACK, 1841 1
          - FIRST CHOICE OF OLD EWES 3
  - Old Queen, 1854
    - Long Wool, by Old Greasy, by Wooster, by OLD BLACK 1 1853
    - Old Queen's dam, 1851
      - OLD BLACK, 1841 1
      - FIRST CHOICE OF OLD EWES 3

It is impossible to fail to be struck by the analogy which subsists between the pedigrees which have now been given of Flying Childers, Shakespeare, and Gold Drop, each pre-eminent amongst his kind.

16. The flock of Dr. Ira Spencer, also drawn from Mr. Attwood's pure blood, and in-bred on the same system, has attained a very high degree of excellence. (See Rendall, p. 75.)

17. Precisely the same remarks apply to Mr. Saxton's (See ditto) The evidence of the correctness of the principle under consideration afforded by these American flocks, is certainly very striking. First, they are derived from the Infantado Cabana, which had been in-bred for ages in Spain. Next, they were in-bred to the hundred head of rams and ewes imported by Col. Humphries. Then they were in-bred to the descendants of the single ewe and ram purchased by Mr. Attwood of Col. Humphries. Again, they have been in-bred to the few individuals bought of Mr Attwood by Mr. Hammond, Dr. Spencer, and Mr. Saxton, in each separate case. And these sheep are pronounced by Dr. Randall, not only on the strength of his own experience, but on that of his statistics, and of the evidence of a number of breeders who have tried all sorts, to be the most profitable sheep in America.

But the advocates of crossing may allege that these sheep would have been better than they are had they received an infusion of a fresh strain of blood—say German or French. The answer is ready—the experiment has been fairly and fully tried, and has failed.

To Australian breeders it is a fact fraught with instruction and interest—and one which bears directly on the subject of this letter—that in America a course of events, with reference to crossing has taken place, precisely similar to that which is now in progress here. The pure Spanish sheep were first imported into America. Some years afterwards a mania for crossing with the Saxons seized the public, and most of the Spanish blood was crossed with the German. Some flocks were kept pure, more by accident or from neglect, than from any knowledge of their value. The lapse of a few more years, however, afforded ample materials for comparing the effects of the cross with those of the continued in-breeding. In consequence of the result of this comparision, attention was again directed to the flocks of pure Spanish blood which still remained; and a controversy between the advocates of each filled the agricultural publications of the day. "This controversy opened about 1835. The Saxons had by far the greatest number of distinguished names, but the Spanish sheep had nearly all the facts on their side. Then a furor for a cross with the French swept all before it. But what has been the end? To what conclusion has the matured experience of the Americans led? The following extracts from Randall will show:—

In allusion to the Saxon mania, at p. 37, he says: "But who can see through the folly of his times? The public were in the midst of a fine wool cyclone. The manufacturer and producer talked of the exquisite fineness of this or that clip—but whether the sheep which bore it yielded much or little, had good or bad carcases, were hardy or feeble, was scarcely a matter of thought." The chief value of the Spanish Merino "appeared to be considered as resting on the fact that they would grade up more rapidly than common sheep toward the Saxon standard of fineness —in other words, make a better cross with the Saxon. The idea that they had a separate value, approaching that of the latter, appears to have entered nobody's mind.

"Mr. Jarvis very unfortunately crossed a portion of his large flock of Spanish Merinoes with the Saxons, when the latter were brought into the country; but he discovered his error in time to correct it, and made those careful arrangements which effectually prevented any subsequent admixtures of blood. He had his descendants of his pure Spanish importations pure to the period of his recent death."

"Charles Jarvis, Esq., of Weathersfield, Vermont, son of Hon. William Jarvis, writes me (January 14th, 1862). . . I have repeatedly heard him (his father) say his Merino ewes sheared about 4lb., till he was persuaded by Mr. Shepherd, the great manufacturer of that day, to get some Saxons to cross with, *as the finest wool was to be in most demand in future*, and as repeatedly heard him end his allusion to the subject by declaring, that if he had thrown his pocket-book, with the price of the Saxon, into the Connecticut river, as he was crossing for the purchase of them, he should be better off." (P. 72.)

Randall himself says of the Saxons:—"I kept them several years and gave them a fair trial before going back to the Spanish Merinoes, which, fortunately for myself, I had never entirely abandoned." (P. 37.)

With respect to the comparative profitableness of the pure Spanish blood and the Saxon strain, taking into account both the yield of wool, and the expense of hay and pasture, he says:—"Were the prices of both doubled, it is obvious that the American Merino would continue vastly the most profitable sheep, particularly if the increase in its fleece since 1840 is taken into account." (P. 62.)

With reference to the result of the use of French blood in crossing with the pure Spanish, Randall lays before us this evidence :—" The following statement of E. L. Gage, of De Ruyter, N. S. (made on behalf of his father and himself), contains interesting details in respect to the management of these sheep, by persons whose skill and success in that particular have not been excelled."

" We had French sheep from September, 1852, till February, 1861. . . . We sold our entire flock of French Merinoes and crosses to J. D. Patterson, Esq., last winter. We have now commenced a flock of pure blood Spanish Merinoes, of the Attwood and Hammond stock, and have about fifty in all."

" With the experience we have in both breeds, it is our impression that the Spanish are the most profitable for all classes of woolgrowers and will keep in better condition on short keep and rough usage." (P. 58.)

And as the result of his own experience in the same cross, Randall says :—" I have recently come to the conclusion that in this climate even these grades are not intrinsically as valuable as pure American (*i. e.*, Spanish) Merinoes."

The decision is summed up, not in Randall's own words, but in those of a judge who must be regarded as thoroughly impartial—Mr. A. B. Allen, the most noted public advocate of the French Merino :—

"The hardly American (*i. e.*, pure in-bred Spanish Merino) properly selected (mind that—*properly selected)* is undoubtedly best for the ordinary sheep master, and most profitable as a wool producer." (P. 67.)

Thus we find that the Americans have finished a course of experiments in crossing precisely similar to those in which we are at present engaged. And they have pronounced an unequivocal verdict based on ripe experience, in favour of the pure in-bred Spanish Merino.

The parallelism in the course of events which have occurred in America and Australia, with reference to crossing and the preservation of pure blood, is brought out in striking relief by the following passage :—

" Judging from the statements in Col. Humphries' manuscript letters laying before me, he has not only found great satisfaction, but great success in breeding his sheep. He speaks glowingly of their hardiness and propensity to fatten, and in the highest terms of their mutton. This gentleman (to whom the farmers of New England should erect a statue) died in 1818, when causes hereafter to be detailed had sunk the Merinoes into contempt and neglect. His invaluable sheep were then scattered, and as a general thing, they appear to have fallen into the hands of those who attached no great value to their blood, for I can learn of but two or three instances where they were preserved distinct after 1826; and it is a lesson to those who term themselves 'breeders,' that those who had the good sense or good luck thus to preserve them in their purity, were farmers of little information, and wholly obscure, until their connexion with these sheep raised them to notoriety."[1]

In Australia, one flock, and only one, of pure Spanish blood, has been preserved untainted by any mixture of heterogeneous blood. That flock is the thoroughbred Camden, now in Victoria. Within two years back from this date this sheep changed hands, the late owners believing that those members of the family which had enjoyed the benefit of an infusion of fresh blood through expensive imported rams, must of necessity be superior to the in-bred sheep. It has consequently been alleged by the advocates of crossing, that this flock cannot be valuable, because the late owners were evidently not aware of the value of their possession. The passage just quoted is the best answer to such cavils; for from it we learn that in America actually the same identical blood, in-bred for the same length of time, fell into "the hands of those who attached no great value to it," but which, nevertheless, afterwards turned out to be "invaluable." It could not, however, with truth be predicated of the late owners of the Camden flock in Victoria, that they were persons "of little information, and wholly obscure till their connexion with these sheep raised them to notoriety."

18. The thoroughbred Camden sheep, now here, have been in-bred to a few individuals of pure Spanish blood (chiefly of the Escurial Cabana) for sixty years. From them, almost every flock of distinction in New South Wales, South Australia, and Victoria has principally derived its excellence. A striking proof of the strength of constitution conferred by in-breeding to good blood is seen in the fact—which I state on the authority of Mr. Campbell—that while catarrh was raging on all sides around them, the pure Camden flock never was affected. This is the more remarkable, as the pastures of Camden proved to be unhealthy for sheep. But the whole history of these sheep, since their arrival in these colonies, present such a forcible illustration of the manner in which the popular prejudice against in-breeding acts and re-acts upon itself, that it is impossible to pass it over in silence.

When first imported by Mr. Macarthur they were not large. At Camden they diminished in size and strength. This degeneracy was almost universally attributed to the system of in-breeding which, most wisely and fortunately for the colony, was uniformly pursued by the Messrs. Macarthur; and it has since been frequently referred to as a proof of the evil effects of in-breeding. But it has now been ascertained beyond a doubt that the Camden pastures were wholly unsuited for sheep. They produce fluke to such an extent that sheep farming there has, of necessity, been abandoned. And that the ground, and not the system of breeding, was the cause of the evil, is rendered certain by the fact that those members of the family which were brought to Victoria by Mr. Campbell, and which have been equally inbred ever since, have not only ceased to diminish, but have increased in size, weight, and strength to an extent far beyond that of the original type of the pure Spanish Merino. The cause of both results is clear. It was the conditions of climate and pasture. These would have similarly affected sheep bred under any system. At the same time, there can be no question that the effects of these conditions were, in each case, in opposite directions, increased and developed by the system of in-breeding. That the evil was not caused by in-breeding, *per se*, is rendered sufficiently evident by the fact that eighteen years of in-breeding on the pasture and under the climate of Victoria have transformed the Camdens into large-framed, and, at the same time, short-legged, round-ribbed, heavy, strong sheep. Their skins possess that dark, rich, rosy colour referred to by Randall, as a sign of health and vigour, as well as of purity of blood. In excellence of constitution, fertility and longevity, they cannot be surpassed.

10. Though last, by no means the least decisive proof of the superlative success which has ever resulted from in-breeding to perfectly pure blood, under favourable conditions, is exhibited by Mr. M'Dougall's breed of Berkshire pigs. Persons accustomed to only ordinary specimens can positively form no conception of the perfection to which the porcine animal has, in this case, been brought, by a strict adherence to what Mr. M'Dougall justly terms "the true and natural principles of breeding." Everyone who has seen the pigs will bear me out in this statement. The degree to which they have been in-bred is fully explained by Mr. M'Dougall in his excellent letter to the *Economist* of the 17th inst.

What has now been stated appears fully to justify the objections I made to the system of breeding recommended to the Society in the case of the Angora goat, and to indicate plainly the course which the most extended experience would dictate. And so far as the immediate object of this letter is concerned, it might here end. But the subject is one of vast importance, both in a physiological and in a practical point of view. It is one which has never received the undivided attention which it demands. No work has ever been devoted to the "True Principles of Breeding" alone. A great work remains to be written, in which in-breeding shall be boldly recognised as the greatest power, for good or for evil, possessed by the breeder. Meanwhile, as in this letter only one side of the subject has been shown, there is reason to fear that it might have a tendency to propagate a certain amount of error, unless a more complete view be exhibited.

For this purpose proof ought now to be brought forward, that in-breeding to bad blood, or under unfavourable conditions of any kind, produces evil. But as the bad effects of in-breeding are so thoroughly believed in by every one, without exception, who has *not* studied the subject; and as every one who *has* done so is fully convinced of its evil effects under unfavourable conditions, it seems unnecessary to occupy space with proof which is required by no one, But it should be distinctly and clearly understood—and it should never be forgotten—that the power of in-breeding to develope and aggravate evil, forms an integral portion of the argument.

I have now, I think, supplied an abundance of materials on which to found an opinion as to the effects of in-breeding. But instead of expressing my own, I prefer to transcribe the following passages from Randall, merely premising that I fully concur with every word contained in them.

A letter to Dr. Randall, from William Chamberlain, Esq., of Red Hook, New York, the principal importer of the Silesian Merino, at p. 60, contains the following passages with reference to the flock of Louis Fischer:—"Mr. Fischer claims that entire purity of blood is indispensably necessary to insure uniformity of improvement when crossed on ordinary wool-growers; and such is the general opinion of wool-growers in Germany, Poland, and Russia; which enables Mr. Fischer to sell at high prices as many bucks and ewes as he can spare; and as he and his father have enjoyed this reputation for so many years, I am fully of opinion he is right. From these facts you will observe that my sheep are pure Spanish."

At p. 96, Randall himself makes the following observations:—"There is a practical fact of the utmost importance in the selection of breeding rams. All do not transmit their qualities in an equal degree to their offspring. The power to 'mark offspring,' as it is termed, according to my observation. depends most on two properties. The first, and by far the most influential of these, is blood. By blood I mean nothing mysterous or unexplainable; I simply mean that blood which has flowed so long in one distinct channel, and through animals so closely alike in all their properties, that it has acquired a power resembling that of species —a power continuously to reproduce animals of the same family, and almost of the same individual characteristic. Under this definition, the unsightly ass may have as high and pure blood as the winged courser of Arabia—the miserable broad-tailed sheep of Asia and Africa, as the far descended Merino of Spain."

"The ram should not only have a faultless pedigee, but if practicable *be drawn from an old, distinct well-marked family of Merinoes, that have been the same as a whole, and uniform among themselves for a long course of generations.*"

Again at p. 76, Randall observes:—"It is by no means true that it is either unsafe or improper to interbreed animals of any degree of relationship. If it is, what has saved the Spanish Cabanas for ages? Or to take a specific instance (where there is no latitude for conjecturing imposibilities,) what has kept up, nay, increased the size and vigour, and improved the form of Ferdinand and Louis Fischer's flock for fifty years, when that flock started with one hundred ewes of one family, and these families have since been interbred, without admixture of a drop of fresh blood? Mr. Attwood's sheep present a still stronger example. According to his statements, his entire flock, now scattered by colonisation into nearly all the States of the Union, originated from *one ewe* (the italics are Randall's) and neither the ewe nor any of her descendants in his hands was interbred with other sheep not descended exclusively from Colonel Humphries' flock. Mr. Hammond bought a small number of Mr. Attwoods' flock in 1844, and he has since, he assures me, interbred solely between the descendants of those identical sheep.

Is it probable that the Creator, who organised all animals into either families, flocks, or herds which strongly incline to remain together, and implanted in none of them but man a disinclination to incest, at the same time established a physical law which rendered incestuous connection *per se* an element of deterioration and final destruction? Among wild brutes, brothers and sisters must constantly pair together. Some kinds of birds are hatched in pairs, as if for the express purpose of remaining together and interbreeding. Has any one discovered, or even conjectured, a decay of the wild denizens of earth or air on this account? Does any one imagine that the elephant is smaller or weaker than he was when he trampled down armed squadrons on old barbaric battle-fields, ages on ages ago; or that the African lion is a less formidable animal than when his angry roar shook the Roman Coliseum?

"It may be said that inasmuch as the strong males destroy or banish from the herd the weak males, and in times of scarcity and hardship the weaker animals of both sexes perish, a natural provision has been made to guard against deterioration, whether arising from in-and-in breeding or any other cause. In respect to animals which herd together in large numbers, and which are periodically exposed to severe vicissitudes of climate and periods of scarcity of food this would be in a great measure true; but there are portions of the earth where classes of animals, particularly those of lower organizations and solitary habits, cannot be supposed to be subject to such casualties, or to any which would have the effect of regularly weeding out those possessed of less than the average of strength and hardiness. And I apprehend we shall find no natural laws necessary for the protection of animal life and vigour enforced in respect to the higher and not the lower organisations, or which require a special and local set of circumstances to bring these benevolent effects into operation.

"Interbreeding between near relatives becomes fatal to physical imperfection; but the drift of testimony goes to show that it is innocuous to perfection.

"A majority of the most celebrated breeders and improvers of English cattle have been close in-and-in breeders, such as Bakewell, the founder of the improved longhorn or new Leicester cattle; Price, "the most successful cattle breeder on record until twenty years ago;" the Collings, Mason, Maynard, Wetherill, Sir Charles Knightly, Bates, the Booths, &c. &c., breeders of shorthorns. In the first volume *American Short Horn Herd Book* (edited by Louis F. Allen Esq.) are diagrams showing the continuous and *close* in-and-in breeding which produced the bull Comet, by far the most superb and celebrated animal of his day, and which sold, at Charles Colling's sale, for the then unprecedented price of 5,000 dols. His pedigree cannot be *stated* so as to make the extent of the in-and-in breeding, of which he was the result, fully apparent, except to persons familiar with such things, and such persons probably need no information on the subject. But this much all will see the force of. The bull Bolingbroke and the cow Phœnix, which were more closely related to each other than half brother and sister, were coupled, and produced the bull Favourite. Favourite was then coupled with *his own dam,* and produced the cow Young Phœnix. He was then coupled with *his own daughter,* Young Phœnix, and their produce was the world-famed Comet. One of the best breeding cows in Sir Charles Knightly's herd, Restless, was the result of still more continuous in-and-in breeding. I will state a part of the pedigree. The bull Favourite was put to his own daughter, and then to his own granddaughter, and *so on to the produce of his produce in regular succession for six generations.* The cow which was the result of the sixth interbreeding, was then put to the bull Wellington," deeply interbred on the side *of both sire and dam in the blood of Favourite,* and the produce was the cow Clarissa, an admirable animal, and the mother of Restless. Mr. Bates, whose shorthorns were never excelled (if equalled) in England, put sire to daughter and granddaughter, son to dam and granddam, and brother to sister, indifferently, his rule being always to put the best animals together, regardless of any affinity of blood,' as A. B. Allen informs me he distinctly declared to him, and, indeed, as his recorded practice in the 'Herd Book' fully proves. It is true that his Duchess family became impotent—ceased to breed; and this has been seized upon as a proof of the danger of in-and-in breeding. But Mr. Bates did not so regard it. He continued his previous course of in-and-in breeding with his other animals until his death, and with triumphant success. The editor of the *American Herd Book* writes me:—'As to Mr. Bate's cows being barren, the defect related to one family only, the Duchesses, which was constitutional in the first of them, and probably accidental. To the point of their ceasing to breed, they apparently grew more perfect in every particular. Mr. Price, whose Herefords were the best in England in his day, declared, in an article published in the *British Farmer's Magazine,* that he had not gone beyond his own herd for a bull or a cow for forty years.

"It is not denied that Bakewell selected his original flock of long-woolled sheep from different flocks and families wherever he could obtain most perfection; but after that he bred in-and-in to the period of his death; and the Dishley sheep did not evince their subsequent feebleness of constitution when under his direction. The same statement will apply to Jonas Webb, the great breeder of South-downs. The Stud Book is full of examples of celebrated horses produced by close in-and-in-breeding. Favourite varieties of the pig have been produced in the same way. There are families of rabbits, game-fowl pigeons, &c., which have been bred in-and-in for a long course of generations without deterioration of constitution, and with a constant improvement of the points regarded in such animals.

"But the misfortune of it is, that while in-and-in-breeding is the readiest road to uniformity and perfection in the thoroughly competent breeder's hands, it is the 'edgetool' with which the incompetent one is sure to inflict swift distruction on his animals and his own interests. And there is another misfortune. Every man who owns animals fancies himself a competent breeder. He who has spent his life in other pursuits, reads a few books, picks up a few phrases, watches the proceedings of a shepherd a little, and then fancies he is a *breeder!* And he is not more mistaken in this supposition than is the unreading man, brought up on the farm, who has no knowledge on the subject outside of its traditions, and who, with the cant of '*experience*' ever on his tongue, never tried a carefully and properly conducted experiment in his life. No man can be a really able breeder who has not an abundance of theoretical knowledge, and an abundance of experience and long observation united. And even then, I am inclined to think, that, like the poet, he must be *born* to his business! Inasmuch, then, as it requires so much skill to detect those qualities and *tendencies* (some of them invisible and only to be ascertained by inferences drawn from numerous minor facts) which should prevent in-and-in breeding in one instance, or indicate its propriety in another, it is perhaps best that the time-honoured public and traditionary belief on the subject should remain unshaken, viz., that interbreeding between animals of any degree of affinity is wrong, and highly dangerous. As long as mankind started peopling the earth in this way, under the direct eye and provision of their Creator, it will hardly do to pronounce it *malum in se*, but let it be considered *malum prohibitum*, if the public pleases, in the strongest sense!"

The observations at the commencement of the last paragraph are admirable. Who has not met "the unreading man, who with the cant of '*experience*' ever on his tongue, never tried a carefully or properly conducted experiment in his life?" Nor can there be a doubt that a really great breeder must be born, not made. And there is unquestionably much good sense in the recommendation with which it concludes.

But the very circumstance that called forth this letter reveals the fact, that although evil may sometimes be prevented by the popular prejudice, it may sometimes also be incurred by it. And an enlightened philosophy demands that truth shall be proclaimed, at all hazards. Had it not been for "that paltry *reticency* which has marked so many celebrated breeders in all countries of the world," and which Randall himself condemns (p. 28), more correct ideas on the principles of breeding would probably have prevailed at the present day.

Little doubt can exist in the mind of any one who seriously gives his attention to the subject, that when the facts relative to the history of breeding become more widely known, the following propositions will be accepted as axioms by all breeders :—

1. That inbreeding tends necessarily and invariably to develope and intensify the characteristics and qualities, internal and invisible as well as external and visible, of the animals between which it takes place.

2 That inbreeding of itself alone, independent of the conditions under which it takes place, has no injurious tendency, but it is the natural mode of breeding.

3 That crossing, or intermingling heterogeneous strains of blood, of itself alone, independent of the conditions under which it takes place, has an injurious tendency, and is an unnatural mode of breeding.

If these propositions be correct, it must follow that inbreeding will be productive of various degrees of evil, if it take place under any of the following conditions. Between animals :—

The progenitors of which were all bad.

The blood of which is composed of heterogeneous strains.

The blood of which contains any particle of a bad strain ; or even of a strain heterogeneous to the other particles.

The health of which is affected by any cause.

The constitution or form of which is bad.

Which are inhabiting a climate unsuited to them.

In short, if it take place under unfavourable conditions of any kind.

On the other hand, it must follow with equal certainty, that if inbreeding take place between animals, the blood of which is pure in the first instance, and has been homogeneous for generations—the more the better ; of good form and sound constitution ; inhabiting a climate suited to them ; and under conditions generally favourable ; then—even without the aid of human selection—the original type will ever be preserved in all its pristine beauty ; whilst the power of tenacity, or marking offspring, will become more and more potential in each succeeding generation. And that when, to these favourable conditions, the benefit of human selection is added ; then and then only, does man enjoy the glorious previlege of exercising the full amount of power over the modifications of animal life, which has been placed in his hands by an all-wise and benevolent Creator.

I am, dear sir, yours truly,

CHARLES H. MACKNIGHT.

Dunmore, 25th March, 1865.

(Acclimatisation Society of Victoria.)

(To be Continued.)

CINCHONA CULTIVATION IN THE MADRAS PRESIDENCY.

Proceedings of the Madras Government, Revenue Department,
12th March 1866.

Read the following papers:—

No. 175. Despatch from the Right Honorable the Secretary of State for India, (Publick,) to His Excellency the Honorable the Governor in Council, Fort Saint George, dated India Office, London, 30th September 1865, No. 27:—

No.	of 1865, dated	
No. 11	of 1865, dated	February 22nd,
,, 16	,, ,,	March 14th.
,, 23	,, ,,	April 4th.
,, 27	,, ,,	,, 13th.
,, 31	,, ,,	May 11th.
,, 34	,, ,,	,, 26th.
,, 39	,, ,,	June 17th.
,, 48	,, ,,	July 11th.
,, 50	,, ,,	,, 25th.

1. I have considered in Council your Despatches in the Revenue Department noted in the margin, on the subject of Chinchona cultivation, and have perused, with special interest, Mr. McIvor's valuable Report for 1863-64.

2. I observe, from the statement of expenses connected with Chinchona cultivation, from the commencement of operations to April 30th, 1864, that the actual expenditure has fallen short of the estimate by nearly 4,000*l*. This result is very satisfactory, and reflects great credit on Mr, McIvor's management.

3. The supply of bark transmitted with your Despatch, dated May 11th (No. 31), was submitted to Mr. Howard, and I herewith forward fifteen copies of the Report of his Analysis. You will observe that although this analysis shews that the Neilgherry barks are very rich in febrifuge alkaloids, and that they are, in this respect, incomparably superior to the barks imported from South America, yet that "the "crystallizations of quinine are mixed with some sulphate of chin"chonidine, which is, commercially, but not medically, a disadvantage." At present, quinine is the only product of the bark which has great commercial value, yet it is the opinion of the most eminent Chemists, such as Mr. Howard and Dr. De Vry, who have made the analysis of bark their special study, that, of the other Chinchona alkaloids, chinchonidine and quinidine are very nearly as efficacious as quinine, and that chinchonine, though inferior to the other three, is by no means deficient in febrifuge qualities. I consider it very important, as affecting the commercial interests of the Chinchona experiment, that an authoritative medical decision should be pronounced on the relative value of the Chinchona alkaloids, other than quinine, namely, chinchonidine, quinidine, and chinchonine. The best way of attaining

this object would be to appoint a Commission in each Presidency, as has been suggested by Sir Ranald Martin with instructions to test the efficacy of those alkaloids on a scale sufficiently extensive to ensure decisive results. Such a Commission should be composed of Medical men who have had long experience in the treatment of fevers, and whose report on a question of this nature would have weight with the medical profession generally. I desire that a Commission for this purpose may be nominated in your Presidency, and in the meanwhile I shall give directions for a supply of the aikaloids in question to be carefully prepared at Mr. Howard's manufactory, and sent out in sufficient quantity to ensure a satisfactory trial of their efficacy. The conclusions arrived at by the Commission should be embodied in a Report.

4. The important questions connected with the manufactory of the Chinchona febrifuge at Ootacamund, which were brought before me in your Despatch, dated August 12th (No. 80), 1863, have received careful consideration, and I now proceed to place you in possession of my general views on the subject.

5. One great object to be attained in the introduction of Chinchona cultivation into India is to provide an abundant supply of the febrifuge at so cheap a rate as to be within the means of the population at large, the coolies employed on public works and private plantations, the small cultivators, their wives and families. In all future operations this object must be kept steadily in view, although it is also desirable that such a return on the produce of the bark should be secured, as will repay the original outlay and subsequent expenditure on the Chinchona undertaking with good interest.

6. There is every reason to expect that both these objects will be fully attained. Bark sent to the London market will, we know, secure good prices, and thus reimburse the Government for the outlay involved in the collection of plants and seeds in South America, their introduction into India, and subsequent cultivation there. A certain proportion of the bark harvest should, therefore, be disposed of in this way; but it is quite clear that if all the bark is sent to England, to be manufactured there, the price of the febrifuge, though somewhat lowered by reason of the increased supply, will still be such as to put the use of quinine and the other Chinchona alkaloids entirely beyond the reach of the working classes of India.

7. I am, therefore, of opinion that it will be advisable to establish a manufactory of Chinchona alkaloids in the neighbourhood of the plantations, and thus to secure a plentiful supply of the febrifuge in an efficacious and, at the same time, in an exceedingly cheap form.

8. The details of this measure involve the consideration of numerous complicated and difficult questions, and I am not at present in a position to issue definite instructions in regard to them. But Mr. Markham will visit the Chinchona plantations during the ensuing cold season, and submit a report to your Government upon the whole subject, and I shall then be prepared to consider any detailed plan which you may recommend, with a view to the immediate commencement of a system calculated to ensure the above results in connexion with the cultivation of Chinchona bark.

9. With reference to the request, contained in your Despatch dated March 14 (No. 16), 1865, that a further supply of *C. Pitayensis* seeds may be forwarded to Madras, I have to inform you that I have already taken steps to obtain a second instalment of the seeds of this valuable species from the forests of Popayan. Forty copies of Mr. Cross' Report of his former proceedings in the forests of New Granada are herewith forwarded.

No. 179. From CLEMENTS MARKHAM, ESQ., to the Secretary to Government, Revenue Department, Fort Saint George, dated Ootacamund, 16th January 1866:—

1. With reference to paragraph 8 of the Despatch from the Secretary of State for India, dated September 30th, 1865, (Publick No. 27), I have the honor to submit my views on the subject of Chinchona cultivation, for the consideration of His Excellency the Governor of Madras in Council.

2. The objects of the Secretary of State in sanctioning the measures which I adopted for the introduction of Chinchona plants into India, and in causing plantations to be formed on the Neilgherry Hills, were the provision of an abundant and cheap supply of the febrifuge derived from them for the use of hospitals and troops in India, and the spread of Chinchona cultivation throughout the Hill Districts, in order to bring the remedy within the reach of all classes of the Native population. His views on this point are distinctly stated in Despatches dated January 16th, 1863, (paragraph 4,) and September 30th, 1865, (paragraph 5.)

3. Two preliminary steps have now been successfully taken towards the attainment of these important ends. The most valuable species of Chinchona have been introduced from South America into India, and, thanks to Mr. McIvor, they have been converted from wild into cultivated plants. But the actual work which will lead to the attainment of the desired results has yet to be done. The ground has been

most ably and zealously cleared. Six years ago Chinchona plants, with the exception of 250 in Java, were wild forest trees, and their bark was only procured by perilous searches in the trackless wilds of the Eastern Andes; while a product so obtained was necessarily sold at a price which put it beyond the reach of millions of sufferers from fever. Now the most valuable species are cultivated on plantations in India; their habits and requirements have been successfully studied, and the best method of producing the largest amount of febrifuge alkaloids in the bark has been ascertained beyond a doubt. It remains to discover the most economical and efficient method of bringing the febrifuge product of the bark within the reach of the people of India, and to adopt such measures as will achieve this result. The consideration of these points has engaged my attention for several years, but I was unable to arrive at any definite conclusions until I had personally inspected the plantations, and had fully discussed the numerous difficult and complicated questions, inovlved in this great undertaking with Mr. McIvor. I now propose to submit certain recommendations for the consideration of His Excellency in Council, 1st, with regard to the treatment of the bark harvest; and 2nd, in connection with the spread of Chinchona cultivation.

4. But before entering upon the main subjects of this Report, I cannot refrain from an expression of my admiration at the ability and zeal with which Mr. McIvor has conducted the operations connected with Chinchona cultivation. The results he has attained are altogether unprecedented in the annals of arboriculture. The information respecting the plants, which was available for his guidance, was very scanty. I and other South American travellers were able to furnish him with more or less complete details respecting the climate of their Native habitat; the elevations at which the different species should be planted; and their habit of growth in the Forests of the Andes. But we could only tell him of Forest trees engaged in a struggle for life with their neighbours, and, therefore, growing under very unfavourable circumstances for the elaboration of the precious alkaloids in their barks: he, with the aid of such data as we could supply, had to discover the numerous requirements of the plants when under cultivation, and the treatment which would be most favourable for the formation of the alkaloids. The success he has attained in the short space of five years is quite astonishing. It may be seen in the ravines of Dodabetta, where the species which cured the Countess of Chinchon is flourishing in a fashion such as was never known on the heights of Uritusinga or Cajanuma. It may be seen from the falls of Pycara

where an avenue of beautiful trees will soon relieve the sombre sameness of a scrubby Neilgherry sholah. It may be seen far and wide along the slopes of the Neddivattam Hills, and it will soon be visible in the rich and fertile soil of the Mail Koondah forests. It is with no ordinary feelings that I have seen all this, and have been gratified with the thought that days of toil and nights of fever in the Caravayan forests, and subsequent weeks and months of intense anxiety have been so fully re-paid. We, who have laboured in South America, are amply rewarded for our work by the knowledge that it has been taken up and continued by so skilled and talented a cultivator as Mr. McIvor. I was particularly struck with the thorough and complete way in which all work has been done on the plantations. The buildings, roads, bridges, and arrangements of drainage are all excellent; and the system of management which has been established, is manifestly working admirably.

5. It is unnecessary that I should touch upon the numerous points connected with Chinchona cultivation, which are fully discussed in Mr. McIvor's Reports. His method of propagation is most successful; and his system of planting in the open, instead of under shade, could never have been questioned if the opinions of those who were personally acquainted with the Chinchona forests had been regarded; but the more recent conclusions at which Mr. McIvor has arrived are so closely connected with the questions relating to the treatment of the bark harvest that they necessarily come within the scope of my remarks. I now proceed to lay before His Excellency in Council the conclusions at which I have arrived respecting the treatment of the bark harvest.

6. The growth of the trees in the most advanced of the plantations—the first Denison—is remarkably rapid, especially as regards the increase of girth and the development of bark. The species which has most completely naturalized itself in India is undoubtedly the *C. succirubra*. I found the finest trees of this species to average, under favorable conditions, a height of six feet and a girth of six inches in the first year, of ten feet and thirteen inches in the second, and of fifteen feet and fifteen inches in the third. But it is in the thickness of the bark and the increased yield of alkaloids that the most marked results have been obtained, and Mr. Howard's analyses have shown that the method of mossing the stems, which is adopted by Mr. McIvor, secures largest attainable deposit of alkaloids in the bark, as well as its most rapid and effectual renewal. This will perhaps be most readily seen by the examination of a table showing the yield of

unmossed, and mossed bark (both orignal and renewed) at different periods of growth, as follows :—

C. Succirubra.

Age of Bark.	Mossed Bark.				Unmossed Bark.			Renewed Bark
	Time under moss.	Purified alkaloids.	Crystallized sulphates.	Chinchonine.	Purified alkaloids.	Crystallized sulphates.	Chinchonine.	
Years.	Months.	Per cent.			Per cent.			
1	6	3·40	2·80	0·60	2·59	......	...	Renewed bark aged 1 year on a tree aged 3 years, yielded 9·72 per cent. of purified alkaloids, 2·72 of crystallized sulphates.
2½	12	6	5·20	0·80	5·06	2·43	...	Renewed bark aged 1 year and 5 months on a tree aged 3 years, yielded 77 per cent, of purified alkaloids. 5 of crystallized sulphates.
3½	11	8	6·94	1·06	......	......	...	Dr. deVry obtained 11 per cent. of alkaloids from the same sample.
3½	18	......	11·34	...	......	......	...	The renewed bark which gave 2·72 per cent. of crystallized sulphate when 1 year old, on a tree aged 3 years, gave 5·85 when 18 months old.

It will thus be seen that the yield of valuable alkaloids on a tree of this species aged two and a half years is 2-43 per cent. when unmossed, and 5·20 when the bark has been mossed for a year; and that the yield of mossed bark is steadily on the increase from 2·80 when the bark has been mossed for six months on a tree a year old, to the altogether unprecedented result of 11·34 per cent. when the bark has been mossed for eighteen months on a tree three years and a half old. The yield from renewed bark is equally promising, giving 2·72 per cent. of the valuable alkaloids when one year old, and 5·85 when eighteen months old. These results give us the certainty that the correct method of treating the Chinchona trees is to cover the stems with moss, to remove the bark in strips periodically, to renew the bark by the mossing system, and to allow the tree to continue growing until it attains to its utmost size. We have not yet ascertained the extreme limit of the possible yield of alkaloids from this species, but it seems certain that it is still rapidly on the increase. It grows in perfection at an elevation of from 4,000 to 5,000 feet above the sea. At a lower elevation the bark is naturally much thinner and less rich in alkaloids yet there is every reason to expect that even on Coffee Plantations, at 3,000 feet, the adoption of the mossing system will lead to the production of bark which will give such a return as to make the cultivation profitable.

7. Although the above system of cultivation is undoubtedly the one best calculated to give the largest returns, and therefore the one that must be adopted on the Government plantations, as well as on all private estates where care and skill can be bestowed on the cultivation, it will yet require extreme attention and the personal superintendence of an instructed cultivator. Some simpler method must be taught to the numerous native Chinchona growers, who will, I trust, soon commence work throughout the hill Districts ; as well as to planters and others who merely raise the trees for the sake of supplying a febrifuge to their coolies. In such cases I would recommend the system which his Excellency the Governor has proposed in paragraphs 9 and 10 of his Minute, dated October 30th, 1865, and which will, I have no doubt prove both profiitable and perfectly simple in practice. In wandering through the Chinchona forests, both in 1853 and 1860, I of course encountered thousands of stems of felled trees, and in every instance I observed that fresh shoots had been thrown up, and had frequently grown into decent-sized trees. During my visit to Hak-galla in Ceylon I examined the stem of a *C. succirubra* tree which had been cut down in April 1864, and observed exactly the same thing—a shoot had sprung from the stem, and grown up quite straight to a height of five feet, with a girth of five inches near the ground. The same thing has taken place on the Neilgherries on every occasion when a Chinchona

tree has been cut down, and there is an excellent example of the vigor with which these shoots grow, in a tree growing amidst brushwood, just outside the gates of the first Denison Plantation. It is a clearly ascertained fact that the felled stumps do send up vigorous shoots in this way, and we know that they may be periodically cut down, and that by treating the bark with moss, a large per-centage of alkaloids will be annually obtained, as the shoots reach the age of three or four years. While then the more profitable though more difficult and scientific system is adopted in the Government Plantations and in all large undertakings, the Coppice-wood method of cultivation will perhaps be more extensively resorted to by the numerous class of growers who will raise bark for their own immediate use.

8. I observed that the *C. succirubra* trees at Naddivattam exhibited two varieties, one with the usual pink flowers and rich green leaves, the other with nearly white flowers and paler leaves. It is important that the cause of this difference should be clearly ascertained, as a full knowledge of all phenomena connected with the growth of the trees is of consequence to the cultivator. This is one of the numerous points which require investigation by a scientific quinologist on the spot, a subject on which I shall dwell more fully presently.

9. With the C. *succirubra* grow the various species which yield grey bark, and which seem in India to be generically known as *C. micrantha.* I may remark, in passing, that India owes the possession of this very important group of Chinchona species to the measures taken by Mrs. Markham at Arequipa. (See *Chinchona Blue Book pp.* 119—23.) The *C. micrantha* grows with and at about the same rate as *C. succirubra,* averaging a height of ten feet, and a girth of twelve inches when aged two years, and of thirteen feet with a girth of thirteen inches at three years. I have spoken of this species as important, because, whereas in its native forests of Huanuco and Huamalies it yields almost exclusively the chinchonine, an alkaloid of inferior value as a febrifuge, Mr. Howard has found that, under cultivation, the chinchonine almost disappears, and that in its place the *C. micrantha* bark yields an extraordinarily large per-centage of the valuable alkaloid, quinidine. The effect of mossing on this bark is also as marked as it is on that of *C. succirubra.* Unmossed bark (aged two and a half years) of *C. micrantha* yielded only 1 86 of alkaloids, while bark of the same age, after it had been mossed for a year, gave as much as 7 52 per cent. of alkaloids, of which 5·82 was of the valuable sort. This is a very significant result. Here is a kind which is almost worthless in its own forests, but which, under careful cultivation, has been made to substi-

tute the efficacious quinidine for its wild product chinchonine. Though it will probably never yield quinine, *C. micrantha* may now take its place on almost an equal footing with *C. succirubra*, and these two valuable species will form all the plantations at a lower elevation than 6,000 feet. The exact influences which have produced this extraordinary change in the products of *C. micrantha* bark are possibly hit upon in Mr. McIvor's interesting and very able letter to your address, dated November 24th, 1865, (No. 105); but it is quite essential that the progress of the cultivator should be assisted and guided by the investigations of the chemist, and these investigations must be made on the spot both with green and dried bark, and with plants growing under various circumstances. Without this aid the ablest cultivator must move more or less in the dark.

10. The *C. Calisaya*, the most famous of all the South American bark trees, and which in its native forests is alike the most beautiful and the richest in quinine, has not been a success in India. I was grieved to see the plants of this species only five feet ten inches high, six and a half inches in girth, at an age of three years, while their stunted and shrubby appearance, with dim colored leaves, is as different as possible from that of the glorious Calisaya of the Caravayan forests. Mr. Howard's analysis of the Neilgherry Calisaya bark is also exceedingly disappointing. Yet there can be no doubt that we have the true species, for the plants at Neddivattam are descended from those procured by Dr. Weddell himself in the forests of Caravaya and Bolivia. There will soon be a large supply of *Calisaya* seedlings both from the trees themselves, and from the seeds obtained by Mr. Money, and a further extensive and careful trial of this most valuable species may be made. But here again the assistance of a scientific quinologist is essential, in order to discover and counteract the influences which have hitherto been so inimical to the development of *C. Calisaya* on the Neilgherries.

11. The Plantations at a higher elevation than 5,500 or 6,000 feet above the sea, and up to 8,350 feet, will consist of the several varieties of *C. officinalis* of Linnœus, and of the trees (*C. lancifolia* and *Pitayo*) yielding the precious barks of new Granada. So long as they are kept clear of the severe frosts of the valleys, the plants of *C. officinalis* flourish luxuriantly on the higher slopes of the Neilgherries, and indeed they are now the most numerous of all the species. The effects of mossing on the product of the bark of *C. officinalis*, known in commerce as *Crown bark*, has been most satisfactory. From a tree, a year and a half old, unmossed bark, gave a total of only 1·50 per

cent. of which nearly half was chinchonine ; while bark that had been mossed for four months yielded 2·408 of quinine alone. The unmossed quills of this bark known to the trade as *Colorado del Rey* or *Rusty Crown,* will already fetch 1*s.* 3*d.* to 1*s.* 4*d.* per ℔. in the London Market. They are very much used by chemists in making bark preparations. The species is evidently capable of much improvement, it flourishes on the open grass land as well as in that of the sholas, and I am convinced that *C. officinalis* plantations will be very remunerative. *C. lancifolia,* of which there are now about 160 plants, is also valuable, and the undescribed species yielding the Pitayo bark is by far the richest in alkaloids of any yet discovered. Even in its wild state the bark sent home with seeds collected by Mr. Cross yielded 11·34 per cent. of alkaloids, of which 5·85 was quinine, 4·19 quinidine and chinchonidine, and only 1·30 chinchonine ; and parcels, in the market are selling at prices 10 per cent. higher than those of Calisaya bark. The Pinon de Pitayo bark belongs to a hardy tree which will flourish with *C. officinalis* on the higher slopes of the Neilgherries, Pulneys, and Koondahs ; and, when treated with moss, it will increase even its present enormous yield of alkaloids. Knowing the great importance of introducing this species, I have made numerous attempts to procure seeds, and during the last two years, I have engaged Mr. Cross to collect them in the neighbourhood of Popayan. That energetic gardener has at last forwarded a small instalment of these precious seeds, and we are now watching in great anxiety for signs of their germination. I enclose a copy of Mr. Haward's, Report of an analysis of the Pitayo bark forwarded with the seeds.

Enclosure No. 1

12. Having offered the above remarks on the most recent results of cultivation with regard to the different species of Chinchona, I now proceed to discuss the main subject of this section of my Report. The method of taking the bark from the trees has been fully explained by Mr. McIvor in the specification of a patent which he has recently taken out. There are, however, several complicated questions relating to the best way of drying it and preparing it for the market which we have considered and discussed together, but which cannot be finally settled until we have the aid of an experienced quinologist, who can try experiments on the spot.

13. Here the work of the Chinchona planter is completed. His bark is ready for the market, and he only has to obtain the best price he can for it. But it is only here that the most important part of the measure undertaken by the Government commences. The princi-

pal object of the Secretary of State was to provide a cheap and abundant supply of the febrifuge for the people of India. The problem to decide is, therefore, the form which the bark should take after it has been harvested, in order to attain the great and beneficent end in view.

14. Long before quinine was discovered, decoction of bark had cured thousands of sufferers from fever; and this simple form of the febrifuge is destined, I trust, to prove a blessing to many a fever haunted District of India. Its manufacture is so simple that it may be carried on by every family that has a few trees planted at its door. It is merely necessary to pound the bark up until it will pass through a rather fine sieve, mix in the proportion of about ten ounces of bark to one gallon of water, boil, and strain off.

15. It is very desirable, however, that the alkaloids themselves, extracted from other ingredients of the bark, should be brought within the means of the poorest Native family, and until this is done Chinchona cultivation in India is not a perfect success. To suppose that this can be effected by sending bark to England, to be turned into quinine and sent out again for sale at 20 shillings an ounce, is absurd. It is essential that some rougher and cheaper way of extracting the alkaloids should be hit upon, since the cost of producing the crystalized sulphates puts them out of the question; and I have devoted much anxious thought to the consideration of this importnt point. I have now no doubt whatever that the alkaloids can be extracted in a form which will lead to the desired result, and further investigations will show what preparation is cheapest and most efficacious. Meanwhile my own opinion, founded on actual experiment, is that the preparation called *quinium* will solve the question.

16. Numerous attempts have been made, from time to time, in South America, to extract the alkaloids roughly, in order to escape the expense of paying freight for so bulky an article as bark. Something of the kind was tried at Loxa in Ecuador; a Frenchman ruined himself in an attempt to establish a manufactory for this purpose at Puno, on the banks of lake Titicaca; and an Italian, at La Paz in Bolivia, actually invented the preparation called *quinio* or *quinium*, and gave some to Von Tschudi, the well known German traveller. The method was afterwards adopted by M. DeLondre of Havre, and in the French works on pharmacy it is called "*Extrait alcoolique de quinquina a la chaux.*" I received a practical lesson in the manufacture of *quinium* from an eminent Chemist in London, and the process is so simple that a brief account of it will not be out of place here.

17. The method we used differed slightly from that described in the *Journal de Pharmacie et de Chimie. Tom.* 33 (1858) *p.* 73. The object is to separate the alkaloids from the lignin, gum, starch, acids, colouring matter, and other ingredients of the bark. The first process is to mix the pounded bark with half its weight of slaked lime and a little water, and this mixture is allowed to stand for a few days in order to give time to the lime to work thoroughly. The lime takes up the acids, colouring matter, and other parts of the bark. The mixture is then treated with strong spirits and boiled. The febrifuge alkaloids are soluble in alcohol, so that, when the liquor is strained off, it consists of spirits with all the quinine, quinidine, and chinchonidine contained in the bark, in solution. It then only remains to distil off the alcohol, and the residuum is the *quinium*, containing all the febrifuge virtue of the bark. In my experiment in London, 1,000 grains of *Calisaya* bark yielded 68 grains of *quinium*, a pale brown substance, in appearance not unlike glue, which contained 33 per cent. of quinine.

18. During my stay at Ootacamund I have tried a similar experiment on a much larger scale, with bark and leaves of *C. succirubra* grown at Neddvattam. Mr. McIvor gave me his active assistance, and furnished a small still and the other necessary apparatus and ingredients. We mixed 10 ℔s. of pounded bark with 5℔s. of lime, and 6¾ ℔s. of leaves with 3½ of lime To this was added thirty bottles of arrack, which was strained and distilled off, and a very satisfactory residuum of *quinium* was obtained. It is of a reddish colour, as a portion of the colouring matter of *C. succirubra* is soluble in alcohol. The cost of the slaked lime is a mere trifle, only thirty measures to a Rupee, which is sufficient for the treatment of 75 ℔s. of bark. More than two-thirds of the alcohol is recovered by distillation, so that the actual cost of a bottle of arrack at 1 Rupee is not more than 4 or 5 Annas, probably much less when *quinium* is manufactured on a large scale. I shall have the *quinium*, which we have obtained, very carefully analysed, but I have already ascertained that it is a strong febrifuge. It can be made up into quinine pills, each containing two to three grains, and a rough calculation leads me to the conclusion that it can eventually be sold at a few annas the ounce. The manufacture is so simple that it can be taught to all native dressers, and made without expense or trouble at hospitals and dispensaries.

19. Although I would not venture to give a positive opinion until the whole subject has been investigated on the spot by a competent quinologist, I yet think that *quinium* manufactories at every place where there is a local supply of bark will lead to the achievement of

the great object of Chinchona cultivation in India, namely the provision of an abundant and cheap supply of the febrifuge in all fever districts. But there is one consideration which at first sight would appear to be fatal to success, and which therefore requires attention. It would naturally be supposed that if the alkoloids can be extracted in the form of a *quinium* at an exceedingly cheap rate, the tendency of speculators will be to buy it all up for sale to quinine manufacturers in the European markets. This, however, will not be the case because *quinium* is not saleable for manufacturing purposes. It is for this very reason that I anticipate success from the manufacture of *quinium* in India. The failure of all attempts to substitute *quinium* for bark in the South American trade convinced me that the same result would attend similar attempts in India, and thus there is no danger that the plentifulness and cheapness of the febrifuge in this form, can be interfered with by unscrupulous speculators.

20. The reasons why *quinium*, though containing all the febrifuge virtue of the bark and therefore an efficacious medicine, is of no use to the quinine manufacturer, are partly explained by Mr. Howard in the last paragraph of his Report of an analysis of bark, dated June 15th, 1864: "Importers," he says "reap in the end more profit from "sending into the European market the raw material than the half "manufactured product." The lime process has a deteriorating effect on the crystallizable properties of the alkaloids, (which is what the manufacturers require) although their medical efficacy remains unaltered.

21. Dr. de Vry, the eminent quinologist, has told me of another preparation from the bark, which he is inclined to think will be more conducive to the objects in view than *quinium*. The process of making it is described in his Report on some bark which I sent to him last July, a copy of which is herewith enclosed, it being the same as was adopted in that analysis. The ingredients required for the manufacture are diluted muriatic acid which costs in England, when bought by the carboy of some gallons, 2*d*, per ℔.; solution of caustic soda; and apparently alcohol. But the expense of the chemicals will be very slight, 2 ℔s. of muriatic acid and 1 of caustic soda being required for the treatment of a cwt. of green, and about double that quantity for dried bark. The preparation is in the form of a fine powder, which consists of all the febrifuge alkaloids of the bark.

Enclosure No. 2.

22. I have entered into these details in order to demonstrate that a cheap medicine can be obtained from the bark, for the use of the working classes of India, which will practically be as efficacious as the

expensive sulphate of quinine. It will be for a skilled chemist, in concert with the cultivator to decide, after careful consideration, whether the febrifuge powder of Dr. de Vry, or the *quinium*, or some other preparation is the one to be adopted for general use. My purpose now is to show clearly that the great end which was contemplated when the Chinchona plants were introduced into India, is by no means difficult of achievement.

23. One measure is, however, absolutely necessary for the success of this great undertaking. The cultivation of Chinchona plants has now arrived at a stage when the co-operation of a scientific quinologist with the cultivator has become of vital importance. There are numerous questions connected with the growth of the plants, with the elaboration of the alkaloids, with the drying of the bark, with the period when the bark has reached its highest per-centage of alkaloids, and with the manufacture of the febrifuge, which must be solved, and which can only be solved on the spot. I have indicated some of these points in paragraphs 8, 9, 10, 11, 12, 13 and 22 of this Report. Indeed it is impossible to consider the subject of Chinchona cultivation attentively without seeing reason, at every turn, for the conclusion that the assistance of a skilled analyzer and chemist on the spot, is urgently required at this stage of the experiment. The enclosed Memorandum by Doctor Cleghorn will show that such a measure would be of great utility in various ways independently of its principal object.

Enclosure No. 3.

24. I would, therefore, strongly recommend that a quinologist of established reputation should be appointed to conduct the investigations above indicated in concert with Mr. McIvor, say, for three years. His duties, in addition to these investigations, would be to decide upon the form in which the febrifuge could be most economically and efficaciously prepared; to instruct medical subordinates and others in the method of manufacture, and to report whether or not it would be advisable to establish a manufactory of the sulphate of quinine itself, in this country. In deciding upon the pay and allowance that should be attached to the appointment, there is, I believe, a good precedent, in the office of Chemical Reporter in the North West Provinces.

(Professor of Chemistry at Roorkee.)

25. It is quite possible that, after all, it will be found advisable to establish a Government Quinine Manufactory here, but we have no data at present to form a decided opinion on that point. If such a measure is resolved upon, it will be a great boon to the planters, because they will be able to dispose of their bark at once; and to the

natives, because the cheaper febrifuge will also be largely manufactured, while the refuse of the manufactory, in the form of quinoidine, can almost be given away in any quantity.

26. I would not venture to express any further opinion respecting this appointment if it was one of an ordinary character, but in truth the number of men who are capable of filling it is so exceedingly small that the choice is narrowed, so far as I am aware, and I have made diligent enquiries, almost to one man. There are several learned quinologists in Europe, some like M. Delondre, in extreme old age, while others such as Dr. Phœbus, M. Guibourt, Mr. Weddell, Mr. Howard, Mr. Hanbury, Carl Zimmer, &c., are not in a position to accept an offer of this kind. But in Dr. J. E. de Vry, the well known Dutch quinologist, who has already visited the Neilgherry plantations and analysed our barks, we have one of the first practical quinologists of the day, who is deeply interested in the present experiment, who has devoted many of the best years of his life to the study of the Chinchona plant and its products, and who has been acclimatized in the tropics. I beg respectfully to suggest that, in the event of my recomendations being adopted, this apointment be offered to Dr. J. E. deVry, whose services are, I happen to know, now available.

27. The 2nd Section of my Report refers to the spread of Chinchona cultivation throughout the Hill Districts of India, a portion of the undertaking which I believe to be of the first importance; because by this means alone can the inhabitants of fever haunted districts obtain the necessary supplies of bark without trouble or expense. There are two modes by which Chinchona cultivation will be extended; the one by the operations of planters, the other by the action of Government officials, or by means of any machinery that may be available in the Districts which are suitable for the growth of Peruvian bark.

28. I am desirous most earnestly to represent that the object in introducing Chinchona cultivation into India was not to shew that the culture would prove remunerative, and that the prospects will be such as to encourage private enterprize. Private enterprize should be encouraged in so far as it tends to spread Chinchona cultivation in the various hill Districts, and to this extent it will undoubtedly further the great objects of this national undertaking. But in some respects the interests of the planter and the Government must be antagonistic. The Government must look to the medicinal, the planter to the pecuniary value of the bark. The planter merely desires to get a rapid return for his money and to keep up the price of bark. The object of the Government on the other hand, is not to make money, which is no

part of its functions, but rather to reduce the price of bark as low as possible, and to bring its use within the means of the poorest cooly in the land. It was to provide an abundant supply of the Chinchona febrifuge for the people that the Secretary of State introduced this cultivation into India, and not to afford another means of making money to European speculators. But while seeking his own profit, the planter does good service in extending the area of cultivation, and from this point of view alone can the interests of private enterprize be considered in connection with the Government measures relating to this subject.

29. Not only will extensive private plantations more or less conduce to the spread of the use of the Chinchona febrifuge amongst the laborers employed upon them; but they will also open up important tracts of hitherto neglected country, and add to the revenue at the same time that they increase the general wealth of the community. Now that analysis has proved the value of bark grown in India, there seems to be every disposition on the part of planters to undertake its cultivation. As many as eighty four pieces of land have been taken up on the Neilgherry hills, under the Waste Land Rules of March 6th, 1863, covering more than 8,000 acres, and there are very few indeed of the purchasers who have not planted Chinchona trees on their estates, while several intend to cultivate Peruvian bark exclusively, and on a very large scale. Many trees are also planted and growing well in the Wynaad District.

30. The Mail Koondah Chinchona plantation will, from the planting point of view, be very important, because it will open up a new and magnificent country, and form a nucleus of propagation round which numerous flourishing private estates will congregate. It will thus, both directly and indirectly, prove a valuable source of revenue to the Government, and the completion of good roads to it will, in a very few years, give rise to the clearing and planting of many hundreds of acres in a hitherto absolutely unproductive District. The Mail Koondah plantation should not, I conceive, be more than 200 acres, and it should be used strictly for propagating purposes, on the same principle as that at Halk-galla in Ceylon. In thus furthering the extension of Chinchona cultivation it will come strictly within the scope of the measure which is now producing such excellent results, wherever its influence is felt.

31. The Koondahs are by far the finest hills I have yet seen in India. The forests cover their sides and crests which bear more resemblance to the superb *montanas altas* of some parts of the Eastern

Andes than to the scrubby sholas of the Neilgherries. The soil is of extraordinary depth and fertility both in the forests and grass land, and there are aboundant supplies of water. Indeed the scenery of those beautiful hills ; the long lines of forests with all the varied tints of foliage ; the rich grass land intervening here and there ; the magnificent waterfalls and precipices ; and the sharp peaked outline of the distant mountains—is far and away the finest I have yet seen in the Western Ghauts. The land reserved by Government is, I am fully convinced, the best site for a Chinchona plantation that has yet been selected, superior either to Dodabetta or Neddivattam. The land is well protected from severe gales ; three or four ranges of forest clad hills mitigate the force of the south-west monsoon, while there is no land intervening between Mail Koondah and the low country to the eastward, to prevent the plantation from receiving a good share of the north-east rains. A bullock track, on such a trace as could be hereafter converted into a cart road, may easily be made, to connect Mail Koondah with the old Malabar road, and this plantation will then be much nearer supplies and labour than any of the others. Burgher labour is already procurable on the spot. I would recommend that the necessary works and communications connected with the Koondah plantation (which has been named Stanley, after the Statesman who first sanctioned my proposals respecting the introduction of Chinchona cultivation into India) be pushed forward at once, so that plants and seeds may be ready for distribution as soon as possible. An estate of 400 acres has already been partly cleared, in an admirable position, within a short distance of the Government plantation, and others will soon follow. The progress of the Stanley plantation, in opening up the Koondahs, as well as in spreading Chinchona cultivations, is quite as important as that of any of the others.

32. The Government Chinchona plantations are, of course, of essential use to private cultivators, by furnishing them with plants and seeds, by pointing out the best methods of cultivation, by eventually taking the lead in the European market and establishing the fame of East India bark, and probably by, hereafter, in the manufacturing operations, taking part of the bark harvest off their hands. I have already discussed most of these points, but I think it right to offer my opinion on the subject of the disposal of plants and seeds. The great object of the Government is to introduce and spread Chinchona cultivation, and I have long been of opinion that the plants and seeds should be given away to all who are desirous of growing them, without any charge. The exaction of payment for them, especially as there is

a per-centage of loss on the plants delivered, must have the effect of retarding the spread of the cultivation. In Ceylon, the plants are given away, the only expense to the cultivator being the carriage to his estate. A planter desirous of undertaking the cultivation signs a form, stating that he has available land suitable for the growth of Chinchona trees, that he undertakes to plant the trees delivered to him upon the said land within 12 months, and to carefully cultivate them when so planted. These forms are filed; a register open to inspection, is kept of applications; and each applicant is supplied in his proper turn. This plan has answerd admirably; as many as 50 planters have already commenced the cultivation in Ceylon: 5,00,000 plants have been applied for, and 1,80,000 have been actually distributed. The price charged for Chinchona plants on the Neilgherries has been lately reduced to one Anna each when 5,000 and upwards are taken, and to two Annas each for any number under 5,000. Now 5,000 is quite sufficient for any one cultivator to take, as he can propagate from his own stock for any quantity above that number. I would recommend, therefore, that the price of one Anna be charged, as now, for each plant, when over 5,000 are applied for, but that any number under 5,000 be furnished to applicants without charge. A register should be open for inspection, so that every applicant can see that he is served in his turn, and each applicant should sign a form similar to that in use in Ceylon. The argument in support of the practice of charging money for the plants is, I am aware, that a man will take more care of what he has paid for than of what he has got for nothing. I believe the argument to be fallacious, and that while a careless man will take care of neither, a careful man will not neglect any of his property that is worth taking care of. Any how, the plan of giving away the plants has answered perfectly in Ceylon, where many planters are taking great pains with them. It is most important that no charge for plants should be exacted from native growers, or from such officials as may be desirous of inducing the Natives in their Districts to grow Chinchona trees, and, as no difference can fairly be made between applicants, the system of charging for plants, when the number applied for is less than 5,000, ought, I think, to be abolished. The great harvest of seeds, which is expected next spring, should be as widely distributed as possible, with instructions for sowing and rearing them, free of all charge.

33. The chief object of introducing Chinchona plants into India is to bring the febrifuge within reach of the classes who cannot afford to buy quinine, or nearly the whole of the sufferers from fever. This

beneficent measure has hitherto received little or no attention, and scarcely any efforts have been made to induce the Natives themselvs to cultivate Chinchona trees, to cause clumps of the fever dispelling plant to rise up round every village in the Hill Districts, and to see that each family is able to obtain fever barks, and understand its use. Until active steps are taken in this direction, and general success has been achieved, the Government cannot pause, for its most important work remains undone. The Secretary of State has expressed his sense of the importance of this part of the undertaking on several occasions, but especially in his Despatch dated Januray 16th, 1863, where he points out that the commercial advantages of Chinchona cultivation are merely a secondary consideration, and desires that Collectors be directed to introduce the plants into the Hill Districts of their Collectorates.

Enclosure No. 4.

34. I beg to enclose, for the information of His Excellency in Council, an extract from a letter which I have addressed to the Under Secretary of State for India, dated December 26th, 1865, on the subject of Chinchona cultivation in Travancore and on the Pulney Hills, and to draw special attention to the extracts which I have quoted from an admirable Minute by Mr. Maltby, the late resident of Travancore, on this subject. His enlightened measures with regard to the establishment of a Chinchona garden at Peermade, with a view to the spread of the fever healing-trees throughout the hill region of Travancore, should be adopted with reference to all other mountainous parts of India.

35. Endeavours should be made to induce all villagers in Hill Districts to include Chinchona trees amongst their products, first for home consumption, and eventually for supplying bark to the villages and dispensaries in the adjacent plains. The machinery for effecting this would vary according to circumstances. Sometimes a Collector or Sub-Collector would take a personal interest in a matter of such vital consequence to the people under his charge; at others a subordinate official or Overseer in the Forest Department may take the work in hand; and it may be hoped that, at least in some localities, the Natives, on receiving a little encouragement, will initiate the cultivation of their own accord. I would suggest that such slight assistance should be extended to these efforts by the Government as the circumstances may require, in order to secure satisfactory results.

36. For instance, Mr. Levinge, the Collector of Madura, has successfully introduced some Chinchona trees into the Pulney Hills, at his own expense, with the intention of propagating from them,

and I believe that Mr. Mardon, of the Education Department, is seconding his efforts. A good beginning has here been made, and a little aid from the Government would ensure most important results. It is impossible for Mr. Levinge to be on the Pulneys for more than a few days at a time, while a little care bestowed on the matter from a permanent resident would lead to the cultivation of Peruvian bark at the very doors of every village in the fever haunted lower Pulneys, and the growth of a surplus supply for the use of sufferers in the Cumbum valley and other parts, A measure of great utility to the inhabitants might thus be adopted at insignificant cost, and I beg strongly to recommend that the Government should pay the salary of a man selected by Mr. Levinge, who should receive instruction on the Neilgherries; and that a larger supply of Chinchona plants be furnished for the experiment on the Pulneys. Mr. Levinge might be requested to submit his views on this subject.

37. If operations are ever commenced in connection with the Perryaur Irrigation project, the opportunity should be seized of introducing Chinchona cultivation into the forests near the banks of the Perryaur, for the use of coolies engaged on the works.

38. Then, again, the Sub-Collector in charge of the Taluqs bordering on the mountains in Tinnevelly might do much towards the introduction and extention of the growth of Chinchona plants, and, if he is prepared to recommend any particular measure, a supply of plants and all other needful assistance should be furnished to him.

39. A great work, in connection with Chinchona cuitivation, will be done on the Annamallays at some future day. Extensive coffee operations have already been commenced at Ponachy, and the Collector of Coimbatore may even now be able to recommend some measure, with a view to extending Chinchona cultivation in that direction.

40. But I believe that the most useful work might be done in Wynaad, under the superintendence of the Deputy Collector, who has opportunities of explaining the value of Chinchona cultivation to the natives, and who should be supplied with all the plants he may think it advisable to apply for. It seems very desirable that the views of the Collector of Malabar on this point should be placed before the Government, and favourably considered.

41. The people of Coorg and of the Mysore mountains will, I have no doubt, avail themselves very readily of any opportunities that may be extended to them of obtaining and growing the Chinchona; and I hope soon to submit a plan with this object in view, for the consideration of the Chief Commissioner. Any number of plants and

seeds that he may require will, of course, be furnished from the Neilgherry Hills, in accordance with views expressed by the Secretary of State, in paragraphs 4 and 5 of his Despatch, dated January 16th, 1863.

42. If the above suggestions are favourably entertained by His Excellency in Council, and followed up from time to time as opportunities offer, a very great blessing will be conferred on the natives. The healing bark will be at their doors, and the powdered bark, or a decoction of it, will furnish them with an unfailing remedy for an otherwise incurable scourge. The work to be done is simple and easy; the good that will be effected is altogether incalculable. It is work that should take precedence of all fostering of private enterprise and supplying of new investments for capital. Dr. Poeppig (Reise, II p. 223) in a passage which I have quoted in a note to my Work (p. 506) gives testimony to the efficacy of the green bark as a cure for fever, from his own experience on three different occasions; and it is now in the power of the Madras Government to extend the blessing then enjoyed by a solitary German traveller in Peru, to a great population of sufferers from fever in this country.

43. This, as it appears to me, is the work that remains to be done in connection with Chinchona cultivation; and the necessary steps may now, I think, be foreseen, down to the time when the Government can fitly retire from active participation in it. Next to the measures suggested in the foregoing 10 paragraphs, the most urgent present work is the completion of the planting out of the 1,200 acres at the Neilgherry plantations. It will be advantageous, in every point of view, if this work is finished as quickly as possible; and the use of convict labor appears to be an excellent way of effecting this, while it is, at the same time, a convenience to the prison authorities. As I have had good opportunities of judging of the way in which this measure is working, during my recent inspection of the plantations, it may be useful if I state the impressions which I have received respecting it.

44. On August 3rd, 1864, His Excellency in Council recorded an opinion that convict labour might, with much advantage, be made use of on the Chinchona plantations, and directed Mr. McIvor to submit plans for jails, to accommodate 500 prisoners at Dodabetta, Neddivattam, and Mail Koondah. On September 6th, Mr. McIvor having completed the plans, his estimate of Rupees 21,225 for the jails, to be paid out of the Budget allowance for the plantations, was sanctioned; and the whole scheme was fully approved by the Government. The

jails are substantially built, and on an admirably devised plan both for health and security. That at Dodabetta consists of one, that at Neddivattam of two large and lofty rooms, with brick walls and roof, supported by beams of Angelly wood. Along each side, there are verandah rooms for dispensaries, offices, warders, &c., and the arrangements for guarding and inspection are very complete. The jails have fire places, the bed places are wooden planks raised 18 inches from the ground, and each prisoner has a rug and two cumblies. The drainage appears to be excellent. At the Dodabetta jail, there is a Jailer at Rupees 50 a month, a Head Warder at Rupees 14, 4 Warders at Rupees 10 each (total salaries Rupees 104), and 17 Policemen, for 82 convicts. At Neddivattam there will be 6 Warders and 32 Policemen for 200 convicts.

45. The Dodabetta jail was completed first, and the prisoners entered it on September 20th, 1865, consisting partly of convicts from the low country, and partly of Chinese prisoners from the Straits Settlements. Unfortunately, no one, with proper authority, was placed in charge of them. The Joint Magistrate at Ootacamund stated that it was impossible for him to visit the jail, and Mr. McIvor had no powers. Thus, from the middle of September until the middle of December, the prisoners, I presume through some inadvertence, were left without any one but the Jailer to control them. The inevitable consequence was mutiny and insubordination. At last, in the middle of December, Mr. McIvor received powers, under the provisions of Regulation I of 1833, as Superintendent of the jail at Dodabetta, and from that day, and not before, the experiment of using convict labour on the Chinchona plantations commenced.

46. The result has, I think, fully confirmed the opinion of His Excellency in Council that convict labour might be made use of on the Chinchona plantations with much advantage. Two or three days after Mr. McIvor took charge, there was an outbreak, the sure result of three previous months of anarchy. It was promptly suppressed, and the prisoners at once saw that good behaviour was their best policy. Ever since they have conducted themselves well; there has been no attempt at escape, no illness, no insubordination. They have worked well and cheerfully, and the experiment, now thoroughly tested, is a decided success. The clearest proof of this is to be found in the extra work done; for where there is a mutinous feeling or discontent, it is difficult to exact the regular tasks, while, under the influence of opposite feelings, extra work is cheerfully done. The chief employment is pitting for Chinchona plants. Free labourers do

16 pits a day. The task of the convicts is to do 20 pits; of the Chinese, 25 pits a day. For extra work, they get half an anna for 5 pits. The native convicts average 7 pits a day of extra work each man, and the Chinese 8½ pits. If cheerfulness at work, strict subordination, and an absence of sickness and of any attempt at escape, are any test of the success of a system of managing convicts, these results have been achieved at Dodabetta jail during the last month.

47. This successful experiment at Dodabetta supplies the assurance that the same results will be attained at Neddivattam jail, if Mr. McIvor is invested with similar powers. The jail at Neddivattam is now quite completed and ready for the reception of prisoners, and it is very important, for several reasons, that it should be occupied by convicts without delay. In reliance on convict labour, the free labourers have been employed on the jail instead of on the plantation work. If, therefore, the convicts are not sent up, the work will be thrown back in the plantations, the nurseries will remain overstocked, and very serious loss will be the result. The sums spent on the jail will also have been wasted. Then it will be absolutely necessary to obtain other labour at all hazards, in order to prevent the great damage which otherwise will ensue. The labour market will thus be entirely disorganized, and there will be much consequent inconvenience and distress. On the other hand, the various advantages arising from using convict labour on these plantations, such as the relief of the crowded state of the Southern jails, the great saving of expense to the State, &c., will be lost.

48. Any fear that there are special facilities for convicts to escape from these jails is founded on a misapprehension of the facts. It stands to reason that if the buildings are arranged with equal regard to safe keeping and inspection, and have the same machinery for guarding the prisoners, there will be exactly the same chances of escape on the plains as on the hills—no more and no less. But the arrangements for custody and inspection in the jails on the Chinchona plantations are superior to those of jails on the plains, so that there are less chances of escape in the former, while the probability of final escape is very small. At Mail Koondah it is almost impossible for a native convict to get clear away.

49. The jail at Mail Koondah, an exact counterpart of that at Dodabetta, is very nearly completed.

50. With convict labour, the work of planting the 1,200 acres will be completed in a little over two years. During this time, the quinologist will be conducting his experiments and investigations, and, in

concert with the Medical authorities, deciding upon the important questions connected with the manufactory of preparations from the bark. On the departure of the convicts, the three handsome and substantial buildings at Dodabetta, Neddivattam, and Mail Koondah will be available for bark stores and manufactories. The quinologist will then be able to continue his operations on a larger scale, to furnish abundant supplies of the febrifuge, and to instruct numerous Apothecaries and Dressers in the method of manufacture. Dispensaries in every part of the country will be able to obtain and prepare their own bark. At the same time, the most advantageous moment for sending home the rich febrifuge-bearing bark will have been ascertained, and East Indian bark will stand so high in the European market that Chinchona plantations will, on all sides, prove highly remunerative. Meanwhile, the cultivation of the Peruvian bark tree will have been extended to the utmost possible extent throughout the Hill Districts of India; and the quinine febrifuge will have been brought within the reach of every sufferer from fever in the land.

51. When these results are fully achieved, the Government may fitly pause. Then, and not till then, will the work be concluded, and the Government be justified, by the sale of plantations and manufactories, in receiving back with interest the whole of its outlay. One of the greatest and most beneficent measures that any ruler has ever undertaken for any country will at last be fully completed.

52. Trusting that the foregoing remarks and suggestions, all of which I have very carefully and anxiously matured, will receive favorable consideration from His Excellency in Council, I have the honor to be, &c.

(Signed) C. MARKHAM.

ENCLOSURE NO. 1.

From J. E. Howard, Esq. F. L. S. to the Under Secretary of State for India, dated 18th November 1865.

I have the honor to report that I have examined the small packet of the fine red Pinon de Pitayo variety of Bark, and find that it contains.

Sulphate of Quinine	5·85
Quinidine and Chinchonidine	4·19
Chinchonine	1·30
	11·34

The total amount of Alkaloids (after deducting the weight of Sulphuric acid of the Sulphates) may be given as ten per cent. of the weight of the Bark sent. This gives promise of an excellent result in the hands of Mr. McIvor, if the seeds should germinate in India.

Two parcels of this red Pitayo variety are in the market at the present moment, producing, respectively, 5·00 and 4·70 per cent. of Sulphate of Quinine. The price asked for these, though less carefully selected than the packet sent by Mr. Cross, is about ten per cent. beyond that of *Calisaya.* It will be seen from this that the Bark is much esteemed in commerce.

I have also examined the packet of leaves sent, and find these to contain a proportion of Alkaloid, on the exact nature of which I should be unwilling to offer an opinion, unless I had the opportunity of experimenting on a large portion of the material.

(Signed) J. E. HOWARD, F. L. S.

ENCLOSURE No. 2.

Report on the yield of two Chinchona barks cultivated on the Neilgherry Hills, and sent to Dr. deVry by Mr. Clements R. Markham, on August 7th. 1865.

Bark No. 1.*

The bark dried at 212° Fahr. and analyzed by my method (*Pharm. Journal, August* 1864,) yielded 3·16 grains of Alkaloids, consequently 9·14 per cent., and 0·142 grains of quinovic acid or 0·11 per cent. Of these 3·16 grains of alkaloids, 1·48 grains were dissolved by ether, consequently 4·28 per cent. of alkaloids, soluble in ether, was contained in the bark.

2. The part soluble in ether, saturated with oxalic acid, yielded beautiful crystalized oxalate of quinine, and left an uncrystalizable mother liquor from which was obtained an amorphous alkaloid, which I have found in all the young Chinchona barks that I have analyzed.

3. The part insoluble in ether contained no quinidine, whilst the sulphate obtained by its saturation with sulphuric acid, crystalized like sulphate of quinine, and not like sulphate of Chinchonine. I consider, therefore, that the part of the alkaloids of this bark which is insoluble in ether, consists chiefly, if not entirely, of chinchonidine. The presence of chinchonine could not be ascertained, for if this alkaloid really exists in the analyzed bark, its quantity must be relatively very small.

4. During my experiments I observed the relatively large amount of

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* The numbers are those attached to the samples of bark in the Memorandum accompanying Mr. McIvor's letter to the Secretary to Government (Revenue Department,) dated May 3rd. 1865.

chincho-tannic acid contained in this bark, and also the absence of chlorophyll.

5. The yield of alkaloids being greater than I expected, I was obliged to change the filter upon which the precipitate of the crude alkaloids, mixed with an excess of lime, was collected, by which operation I sustained a small loss. The amount of alkaloids in the bark is, therefore, greater than the obtained quantity of 9·14 per cent. This was proved by the following experiment.

6. Ten grains of bark dried at 212° Fahr. were lixiviated in a narrow glass tube, so that the column of bark powder had a length of 10 centimetres by 150 cubic centimetres of diluted hydro-chloric acid containing 4 per cent. of pure acid, which lixiviation lasted three days. The liquid obtained by this procees was afterwards precipitated by 15 cubic centimetres of a solution of caustic soda, and the precipitate collected on a filter. After washing and drying the precipitate, it was dissolved in alcohol, and the clear alcolic solution, containing all the alkaloids of the 10 grain of bark, evaporated to dryness. When the residue of the evaporation had been so long heated on a water bath that its weight remained constant, it was proved that this weight was 1·116 grains. The analyzed bark consequently yielded 11·16 per cent. of alkaloids, which are forwarded with the Report.

Bark No. 4.

47·67 grains of bark dried at 212° Fahr. and analyzed by my method yielded 1·36 grains of alkaloids, consequently 2·85 per cent. and 0·293 grains of quinovic acid, consequently 0·61 per cent. Of these 1·36 grains of alkaloids 0·77, were dissolved by ether, so that the bark consequently contains 1·61 per cent. of alkaloids soluble in ether.

The part soluble in ether, when saturated with oxalic acid, yielded beautiful crystalized oxalate of quinine, and left an uncrystallizable mother liquor, from which was obtained the above mentioned amorphous alkaloid. The part insoluble in ether contained no quinidine, but the quantity of 0·59 grains was too small to ascertain with certainty if this part contained either pure chinchonine, or a mixture of this with chinchonidine. During my experiments, I observed that this bark contains a large amount of chlorophyll.

Conclusion.

No. 1 bark is the most valuable specimen I ever met, as I never before manipulated a bark yielding the enormous quantity of 11 *per cent.* of alkaloids.

(Signed) J. E. deVry.

ENCLOSURE No. 3.

Memorandum.

The indegenous *Materia Medica* of the Hill ranges of Southern India is varied and extensive, and comprehends many plants of proved value.

2. The best means of bringing these into general use has often been discussed, and was under the earnest consideration of the Drug Committee (appointed by the Secretary of State for India) when I left London in September 1865.

3. A few of the many officinal plants, both indegenous and naturalized, which abound at or near Ootacamund, may be mentioned.

INDIGENOUS.	
Cannabis Indica	Indian Hemp
Berberis	
Ophelia Exacuna	Chiretta or Hill Gentian,
Andrographis paniculata	Creyat.
Gnaltheria	Winter green oil.
Pterocarpus Marsupium	Kino.
Citrus	Citric acid.

NATURALZED.	
Argemone Mexicana	Oil.
Digitalis purpurea	Leaves.
Mint Pepermint Lavender	Essential oils.
Hyosciamus Taraxacum Belladonna	Extracts.
Scammony.	
Jallap Aconite	Roots.

4. The Superitendent of the Government Garden at Ootacamund could collect specimens of these and others, for transmission to the Medical stores, but the preparation of the oils, extracts, &c., could not devolve upon him, and from the want of a properly qualifide *pharmacien*, there has been little progress made in the employment of Hill medicines.

5. on this account, I concur in the proposal to engage a skilled Pharmaceutist, in order that the medicinal plants growing around us may receive due attention, and the officinal preparations be made, in an approved manner, on the spot, from fresh leaves, seeds or roots. In the end, I believe this would prove an economical arrangement.

COIMBATORE: (Signed,) H. CLEGHORN, M. D.

17th January, 1866.

ENCLOSURE NO. 4.

Extract of a letter from Mr. Clements Markham, to the Under Secretary of State for India; dated 26th December 1865, on Chinchona Cultivation in Travancore, and on the Pulney Hills.

1 have been engaged in examining portions of the mountain range between Palghaut and Cape Comorin, with a view to the selection of sites for Chinchona cultivation. The spread of this cultivation throughout the hills of India by means of numerous centres of propagation is, in my view, essential to the success of the principal object for which the experiment was undertaken, and I therefore believe that the result of my recent journeys will prove useful. I shall enter fully on the general question in my Report to the Madras Government, a copy of which I shall shortly have the honor of transmitting for the information of the Secretary of State in Council. I now propose to report the particulars of my journeys in the hills of Travancore and of the Madura District.

2. Considerable progress has recently been made in planting on the Southern Ghauts, and the establishment of coffee and tea estates will always lead to the cultivation of Chinchona. The Natives are fully alive to the importance of introducing the Quinine yielding trees. The Dewan Peshkar of the Southern Division of Travancore, with whom I had a long conversation at Punnaguddy, asked me for Chinchona seeds; and in subsequent conversations with the Rajah of Travancore at Trivandrum, and with the Dewan Madava Row, I found that considerable interest was already taken in the measure. Mr. Newill, the Resident, thought it desirable that I should visit Permade and the neighbouring Hill District, with a view to suggesting the course that should be followed by the Travancore Government, with reference to Chinchona cultivation; and I considered it to be my duty to accede to his wishes. I had the great advantage of the company of Dr. Cleghorn, the Conservator of Madras Forests, during this expedition. My travelling expenses to Peermade were defrayed by the Travancore Sirkar.

3. The mountains from Palghaut to Cape Comorin may be divided into two distinct regions, for purposes of description, which are separated for each other by that extensive unknown tract of country, where the sources of the great river Periaur are still concealed from our knowledge. The southern region extends from Cape Comorin to Courtallum, and comprises the mountain chain which divides Travancore from Tinnevelly. Near Cape Comorin isolated masses of weather-

beaten rock rise abruptly from the plain, and form an outline of battlements and pinnacles against the sky; and the continuous range only commences north of the Aramboly Pass, where the mountains attain a height of 3,000 feet and upwards. The range is not broad and has little or no intermediate table-land, but slopes abruptly from the summit ridge to the rich green expanse of Travancore on one side, and to the dried up plain of Tinnevelly on the other. The peaks rise to a height of 6,000 feet. Several coffee estates have already been formed on these hills. The most southern are at Assambhoo, at an elevation of 3,000 feet, immediately above the Aramboly Pass. General Cullen, who was Resident from 1840 to 1860, originally formed a coffee garden at Assambhoo, which is now owned in partnership by the first Prince of Travancore and the Dewan. But within the last few years the Reverend J. Cox, a Missionary, a Mr. Gordon, and two planters from Ceylon (Messrs. J. & J. C. Grant) have opened coffee estates at Assambhoo with every prospect of success. The principal drawback to this site is its exposure to severe gales of wind, which do much injury to the plants. Further north, and on the Tinnevelly side at the feet of those grand precipices called Maha Indragherry and Tiranamally there is a small coffee estate owned by a wealthy and liberal-minded Mahomedan named Meer Anjemir, who lives at Punnaguddy. At the foot of the peak of Aghastya-mullay, in Travancore, a fine tract of forest land has been purchased, but not yet cleared, by General Sim. On the Tinnevelly side, in the forests near Papanasum, 500 acres have been granted to Mr. Barter of Tuticorin. This estate which has not yet been surveyed is on the Vellar river, and 50 yards of jungle are to be reserved on each side of the stream. Messrs. Cocq of Tuticorin have long had coffee estates near Courtallum, which are now managed by Mr. Crabbe; and Messrs. Binny of Madras have tea, cocoa, and spice gardens under the management of Mr. Liddel of Quilon in Arriangole Pass, at an elevation of only 1,200 feet above the sea. There are other clearings of minor importance.

4. There is a notable difference between the climate on either side of these ghauts. On the west side the slopes are abundantly watered by the south-west monsoon, and the streams fall into the backwaters, supplying the narrow strip of land with water in abundance. On these Travancore hills clearing may be carried on to any extent without detriment to the low country, which could well dispense with some of its surplus moisture. But on the east side the due supply of water for the tanks and channels is a necessary of life to the people inhabiting the wide plains of Tinnevelly. Indiscriminate felling on

these eastern slopes would lead to most deplorable results, and the evil is already beginning to be felt. Further grants of land have been prohibited in the Tenkassy Taluq, and in Nanganary the people complain bitterly of the drying up of the streams. There can be no doubt that serious consequences will arise from indiscriminate felling; but when Rupees 1,84,000 are required for the repair of tanks and channels in Tinnevelly, and only Rupees 48,000 are granted, the failure of water cannot be *entirely* due to a reduction in the rain-fall caused by clearing on the hills.

5. Chinchona plants, on a more or less efficient scale, will be hereafter cultivated on all the coffee clearing and other lands that I have enumerated; and it should be remembered that their beautiful foliage will be even more effectual in wringing moisture out of the passing clouds than the original jungle. The Natives are well acquainted with the value of quinine, and when the trees which yield it are growing round the base of that magnificent peak, 6,000 feet above the sea, that is dedicated to their great Rishi and Physician Aghastya, they will fully appreciate the blessing that has thus been brought to their doors. Severe gales of wind cause the chief difficulty in commencing cultivation on these mountains, especially on the exposed slopes of the Aghustyamullay; but the Chinchona trees, when they once get through the first two or three years of their growth, will not suffer irreparable damage from this cause.

6. I now come to the northern Division of the mountainous region extending from Palghaut to Cape Comorin. It includes the Anamally and Pulney Hills in British territory, and an extensive Hill District within the Native States of Cochin and Travancore; and differs from the Southern Division in possessing several ridges with wide stretches of table-land, instead of single lines of mountains sloping directly from their summits to the plains on either side. The Travancore portion of this region is by far the most extensive, but until quite lately no attempt had been made to open cultivation on it, and the southern part is still entirely unknown; Mr. Maltby, in 1862, formed a small garden at Peermade on the western verge of the Travancore mountains, and several coffee planters have since settled in its neighbourhood. Their pioneer was Mr. Munro, and he it was who made the road to the foot of the ghaut for the Travancore Sirkar. The road commences at Kotiam on the Cochin backwater, and passes over undulating country, covered with forest, to the foot of the mountains at Mundakayum, a distance of 33 miles. For this distance a good bandy road has been completed and bridged throughout. At Mundakayam there is a large

river, Kullapoliem, where a good stone bridge is in progress, and here the ascent of a ghaut commences, which is quite equal in beauty to that of Sisparah. The road up the ghaut is not completed, and extensive blasting operations are necessary, but large gangs of coolies were at work, and rapid progress was being made. The coolies were getting four Annas a day (an ordinary laborer's pay in the plains being two Annas) and for boring rock they are paid by the foot. They get four Annas a foot, and can do three feet a day, but are not paid unless their labor results in a good blast.

7. At the top of the forest covered mountains is the region called Peermade, a country of grassy slopes, splendid forest land, rocky ridges and lofty peaks, averaging an elevation of 3,000 feet above the sea. At its western edge, whence there is a glorious view of the 30 miles of forest as far as the backwaters and the sea, Mr. Maltby who was then Resident of Travancore and Cochin, built a house which he called Maryville, and established a Chinchona garden for the Travancore Government. This was in 1862.

8. The Rajah granted Rupees 1,000 for a garden and glass house, Rupees 300 for getting Chinchona plants from the Neilgherries, and Rupees 40 a month for a gardener and coolies ; and in December 1861 Mr. Maltby wrote a most interesting Memorandum on the subject. "The garden, " he then said" may be viewed as formed to aid in the "introduction into the mountainous country of Travancore of the Chin-"chona plants, and its other objects may be considered as subordinate "to this, such as the growth of tea, coffee, &c. The question is, how "the Travancore Government can most successfully second the efforts "of the British Government, and make due use of its mountain region in "extending Chinchona cultivation. There are mountains near Maryville "on which subsidiary plantations may be formed up nearly 6,000 feet. "Extensive seed beds should be formed, and there should be about 10 "acres of coffee. By selling the seedlings to planters, at a yield of half "a ton an acre, the profit would probably cover the cost of the garden. "Tea should be raised in the same way, and the towns on the coast "might be supplied with potatoes and onions. The Maryville garden "was commenced by planting apples, pears, grapes, oranges, straw-"berries, raspberries, roses, geraniums, fuchsias, &c., and kitchen "vegetables."

9. On December 11th, 1861, the four first Chinchona trees were planted by Mr. Maltby at Maryville : a *C. Peruviana* in the north-east corner, a *C. Succirubra* in the south-east, a *C. Nitida* in the south-west, and a *C. Micrantha* in the north-west. But his admirable suggestions

have been very inefficiently followed out, since ill-health unfortunately obliged him to retire in 1862. Mr. Newill, the present Resident, furnished us with the following Memorandum dated December 1865 :—
"The Government garden at Peermade was established about three "years ago. In March 1863 about 500 Chinchona plants were brought "from Ootacamund by Mr. Hannay, the Superintendent of the Sirkar "garden, they were then about two months old, and from one to two "inches high. Many died when quite young from the effects of damp, "drought or cutting winds. There are now about 220 strong and "healthy plants, and some 200 young plants have been propagated. "The *C. officinalis* has a tendency to throw out branches along the "ground, like a creeper. The tea plants are now three or four feet "high and seeding freely."

"So far the experiment has been encouraging, and it seems desirable "for the Sirkar to pursue it so far as to provide the means for planters "to try it on a more extensive scale, though I question the expediency "of the Sirkar entering into extended operations, which may be left to "the enterprise of others."

Chinchona Plants at Peermade, December 1865.

Name of Species.	Number.	Average Height.	Height of tallest.	
C. Succirubra, ..	79	5 feet.	8 feet 6 inches.	Ages two years and ten months.
C. Micrantha, ..	46	3 ,, 6 inches, ..	6 ,, ...	
C. Peruviana, ..	27	3 ,, ...	6 ,, ...	
C. Nitida, ..	13	2 ,, 6 ,, ..	3 ,, ...	
C. Officinalis, ..	60	2 ,, 6 ,, ..	4 ,, 7 inches.	
Total, ..	225			

10. I found the plants at Maryville looking vigorous and healthy, although the leaves and some of the branches had suffered severely from the cutting land winds of the north-east monsoon. The site is not, I think, the best that could have been chosen. It is exposed to the whole force of the land wind, as well as to the south-west monsoon, yet the plants may be successfully propagated here, and if the plantation is extended, there is a well sheltered shola to the south-east. The elevation above the sea is 3,300 feet, and the temperature is suitable. The rain-fall, according to observations made for General Cullen varies, from 125 inches on the western skirts to 40 inches on the eastern crests of the ghauts. The girth, close to the ground, of the largest *C. Succirubra* tree, was nine inches. There were 225 Chinchona plants

exclusive of cuttings, 5,000 Coffee and 4,000 tea seedlings. With regard to the establishment, I found that Mr. Hannay, the Superintendent, received Rupees 120 a month, a blacksmith Rupees 15, a carpenter Rupees 14, a maistry Rupees 12, and four coolies at 7 Rupees each; making Rupees 238 a month, or about £285 a year. There is no regular allowance for the garden, and no glass house has yet been completed.

11. We have reported our impressions and submitted various recommendations respecting this garden, and generally on Chinchona cultivation in these hills, to Mr. Newill, for the consideration of the Travancore Government. The Maryville garden should be the source of supply, whence Chinchona plants should be forwarded to every part of the Travancore hills as opportunities for their cultivation may arise. With this view the expenditure might well be raised to £500 a year, a gardener might be procured, trees might be cultivated for seeds, and propagation might be extensively carried on, and the garden should be self-supporting through the sale of coffee and tea seedlings, and of kitchen vegetables. The cultivation of *C. officinalis* should be given up, the elevation being insufficient, and attention should be turned entirely to the spread of *C. Succirubra*, *Calisaya* and *Micrantha*. This measure originated by Mr. Maltby will, if properly and systematically carried out, be a great blessing to the people, and highly creditable to the Travancore Government.

12. The coffee estates, the first of which was only commenced in 1862, are from a mile to four miles north-east of the Maryville garden, and are rapidly taking the place of the beautiful natural sholas. They, are at present six in number, and the extent of country taken up, cleared and planted will be seen at a glance in the following table :—

Coffee estates, &c., at Peermade on the Travancore Ghauts.

Name of estate.	Owners	Managers.	Acres.			REMARKS.
			Grant.	Cleared.	Planted.	
1. Maryville.	Travancore Government.	Mr. Hanay... ..	..	..	..	Chinchona Plantation.
2. Hope.	Originally owned by Mr. Munro now by a Company.	Mr. G. Baker.	500	300	150	Commenced in 1862.
3. Woodlands and Keppoch.	Originally owned by General Stevenson, now by four Partners— .. 1. General Stevenson. 2 Mr. Crawford, (Com. Agent at Aleppy). .. 3. Mr. Aspinal of Cochin. 4. Mr Oughterson. ..	Mr. Oughterson, Mr. Stevenson, (Assistant). ..	500	140	110	Commenced in 1862.
4. Ashly.	Dr. Petman.	Dr. Petman.	200	100	60	Commenced in 1863.
5. Stagbrook.	Mr. R. Baker.	Mr. R Baker. ..	200	30	30	Commenced in 1863.
6. Fairfield.	Mr. H. Clarke. .. .. Dr. R. Clarke.	Mr. H. Clarke.	900	15	..	Mr. Clarke has only recently commenced felling.
7. Twyford	Mr. Richardson, Rev. Baker, (Missionary).	Mr. Richardson.	600	40	40	Commenced in 1864.
8. Wulunjun Canum Shola, containing 1,400 acres ..	Mr. Crawford, (Com. Agent at Aleppy).	.. ..	500	..	..	Felling not yet commenced.
9 Messrs. Pierce, Leslie & Co. of Cochin, and Mr. Berry.	.. ..	.. ..	..	..	..	A grant of about two square miles.

13. All the country occupied by these coffee planters is well adapted for Chinchona cultivation, and I was glad to find that they were inclined to undertake it. The tract fitted for coffee extends from the crest of the Ghauts to a range of hills about three or four miles further to the eastward, and for many miles to the north and south. The country is intersected by well wooded ranges of hills occasionally running up into fine peaks, such as Amartha-mullay overlooking the low country, which is 4,700 feet above the sea; the Anaconum peak overhanging the Woodlands estate, and several others not marked on the Trigonometrical Survey, but which will be found on the accompanying map. The scenery is exceedingly beautiful. The undulating hills are covered with tufts of lemon and elephant grass *(Andropogon)*, growing to a height of 6 or 8 feet; and the valleys and mountain sides are clothed with fine sholas. Unlike the comparatively stunted stems and umbrella-like foliage of the Neilgherry and Pulney hills, the trees in the Peermade sholas, at a lower elevation, grow to a great height and present a grand appearance. The undergrowth beneath them consists of cardamom, wild ginger, zedoary, rattan, a small bamboo called *etah* by the Natives, and a few ferns. The following are the principal trees—the *Parlmarum (Isonandra acuminata)*, a large tree only recently discovered by General Cullen, much used for planking; the *Nanga*, called by the planters "iron wood," appears to be a sort of poon, *(Calophyllum)*; *Anjelic (Artocarpus hirsutus)* yielding a very valuable timber, *Aranili* a tree of the jack tribe, from the bark of which bags are made; *Terminalia catappa* or Indian Almond; *Erythrina Indica* at the edges of the sholas, wild cinnamon; two species of *Eugenia*, and some other *Myrtaceæ*; two kinds of *Garcinia* or gamboge trees; and the *Canarium strictum* or black dammer tree, called by the Natives *Congilium-marum*. Besides the *Eugenias* there are several other beautiful flowering shrubs and herbs outside the sholas, but still under the shade of their trees, such as *Osbeckia*, *Crotalaria*, and the brilliant dark blue *Torrenia* so common on the Sispara Ghaut. These fine sholas, with their valuable timber, are fast disappearing under the axe of the planters, and the loud crash of falling trees is constantly heard on the hill sides. The sites best adapted for Chinchona planting are the forest slopes beneath the peaks called the Tumbys, and within Mr. Clarke's estate. They are well sheltered from the cutting land winds, and partially so from the south west monsoon, while the numerous mountain streams supply abundance of water. It is, I am happy to say, the intention both of Mr. Clarke and Mr. Oughterson to undertake Chinchona cultivation.

14. A telegram from Mr. Leavinge, the Collector of Madura, induced us to undertake an expedition from Peermade across the mountains by a very unfrequented route, to the Madura District. I considered it desirable to take this line, both because it would enable me to judge of the country across the whole width of the Travancore Ghauts, and because I should thus have an opportunity of consulting Mr. Levinge on the important subject of Chinchona cultivation on the Pulneys.

15, A reference to the map (Sheet No. 62) will shew that there is a very extensive mountain region between the plains of Travancore and those of Madura. The southern portion extending over an area of about 30 miles by 20, out of which issues the river Periaur, is entirely unknown and is a blank on the map. The northern part borders on the Anamallays and is almost as little known. The great river Periaur, flowing from south to north, traverses the centre of this mountain region, and after a long course, eventually turns to the west and falls into the Cochin back-water. Our route passed right over this country, crossing the Perryaur. The mountains are owned, under the Travancore Government, by the petty Rajah of Pooniat and from time immemorial there has been a track called the Pooniat road, traversing Peermade, and passing down into the Cumbum valley on the Madura side. It was used by the elephant hunters, whose old pits are still to be seen, and by the Pooniat Rajah's cardamom gatherers. The ancient Pandyon kings of Madura are said to have received their supplies of betel, pepper, and cardamoms by this route, in exchange for rice and cloth. At present the Madura people annually drive their herds up to these mountains for pasturage, but the only inhabitants are a wild tribe of wandering hill people called Malas. They are seldom seen.

16. The distance from Peermade to the Periaur river is 7½ miles on the map, 10 miles by our route ; from the Periaur to the eastern crest of the ghauts 5½ miles on the map, eight miles by our route; from the crest of ghauts to Goodaloor, on the Madura side, eight miles on the map, 12 miles by our route ; a total distance of 30 miles on foot, over a most difficult country.

17. The road leads from Peermade across grassy uplands, with much rock on the surface, to the river Urraday, whose affluents water the Hope and Woodlands estates and crosses the stream at the Urraday Tavalum. These Tavalums frequently occur on the map. They are merely places where herdsmen are in the habit of resting their bullocks, and are known by several acres being over-grown by a species of *Composita, (Blumea)* the result of bullock manure. The land must be very rich and valuable. There are several magnificent sholas on the hills over-hanging the Urraday

and facing to the westward; but after crossing them, the country to the eastward presents a hotter and drier appearance, the sholas are smaller, there are large patches of *earth* or hill bamboo in them indicative of a poor soil, and they often only extend a few yards on either side of the streams. We saw several bison on high hills to the south, samber bounded before us into the sholas, and there were numerous traces of elephants and cheetahs. The country appears never to have been entered by a Shikaree. We passed through the *Pambanur* (snake) *Tavalum*, and over hills covered with grass 10 and 12 feet high, a most blinding and tedious march, and finally came by a steep descent through bamboo jungle to the banks of the Periaur.

18. Although this was nearly the lowest season, the river was 30 yards across, and we found by the marks that, during the monsoon, it rises eight feet higher. The whole of this immense volume of water now runs to waste in the Cochin backwater. But there has long been a project to throw a dam across, at a point 14 miles south of where we crossed, and to make a cutting so as to throw the river over into the Madura District.

19. The coffee plantations have already begun to attract trafic over this formerly unfrequented route, and before long a good bullock track and a bridge over the Periaur will become an urgent requirement of the District. The rice and cloths of Madura will be exchanged for the silver of the planters, and the betel, cardamoms, and tobacco of Travancore. We found 200 bullocks on the banks of the Periaur laden with rice for the coffee plantations, coming from the Cumbum valley. The bullocks were driven in and made to swim across, while the bags of rice were ferried over on a rude bamboo raft; a process which seemed likely to occupy at least twenty-four hours. One only has to be a witness of proceedings such as this, to be deeply impressed with the delay and injury caused by the absence of bridges. We crossed the river on the same bamboo raft, but the coolies with our tent did not arrive until late, having been driven or rather frightened off the road by a herd of wild elephants. The river is here lined on both sides with clumps of bamboo, the bed is very rocky, and the water clear and cool. As night closed in, the fires of the herdsmen and the mass of white bullocks under the bamboos were finely reflected in the river. Fires throughout the night were necessary to keep off the tigers which abound in extraordinary numbers, denoting the great abundance of other kinds of game.

20. After passing up the bamboo jungle which fringes the river on the east side we entered upon a country presenting a still more dried

up appearance, though the grass was still of immense height. Stunted trees were scattered over the open hills, chiefly *Terminalia coriacea,* and here we met with the first teak trees The land is formed into a large amphitheatre of hills with two sharp peaks, and after descending the slopes we entered a thick bamboo jungle, and had to wade along the bed of a torrent, up to our kness, for a considerable distance. The woods abound in black monkeys with white beards, jungle fowl, and imperial pigeons. The Goodaloor Tavalum is an open space in the midst of the forest, about 5½ miles from the Periaur, and close to the crest of the eastern side of the ghauts. The descent into the Cumbum valley is rapid and precipitous over huge boulders of rock, and often crossing a mountain torrent. The ghaut is clothed with splendid forest trees. Blackwood *(Dalbergia latifolia),* one of which I measured four feet from the ground and found to be 17 feet in girth, and another was at least of equal size : *Vengay* trees *(Pterocarpus marsupium)* yielding excellent wood for building purposes, as well as the gum *kino* of commerce ; a tree called locally *Vekali (Conocarpus latifolius,)* the wood of which is also used for building ; the black dammer tree ; and lower down great quantities of the loathsome *Sterculia fœtida,* which yields an inferior kind of poon spar. Here and there we got peeps of the rich Cumbum valley as we descended, with mountains on the opposite site. . On first coming out into the valley, there is a wide stretch of open grass land dotted with the *Yerkum* bush *(Calotropis gigantea),* where immense herds of cattle were feeding, and further on there are fields of castor oil, and fine crops of toor and raggee. The shade in the upper part of the valley is afforded by the umbrella thorn *(Acacia platifrons),* the *Euphorbia pentagona* growing like a tree, and the Palestine thorn *(Parkinsonia aculeata).* Lower down the valley, the road is shaded by banyans and tamarinds. I have described the irrigation of the Cumbum valley, and touched upon the subject of making a road thence to Peermade in the accompanying Memorandum on the Periaur. I need only add here that, on reaching Pereacolum where the cholera was raging, we went up to the Pulney Hills without delay, by the Pereacolum Ghaut.

21. My examination of this route convinced me that the country eastward of Peermade was unsuited for Chinchona cultivation, although I think it probable that if the dense forests round the sources and upper course of the Periaur are ever partially cleared, good sites will be found for the growth of the red and grey barks.

22. Mr. Levinge obtained 12 Chinchona plants from Ootacamund in March 1864, and they were planted in his garden at Kodakarnal,

on the Pulneys, in the following April. They were then two or three inches high. The site is well sheltered, with a north-west aspect, and the land was originally not shola but common grass land : about two feet of mould below which there is large stoned gravel, and below that red clay. Holes were dug well through the gravel, and the earth was mixed with a little manure, in which the trees were planted nine feet a part each way. The site is 6,985 feet above the sea. On December 18th, 1865, the state and condition of these trees was as follows :—

CHINCHONA TREES.

At Kodakarnal on the Pulney Hills, December 1865.

Species.	Height.		Girth of stem.	Remarks.
	Ft.	In.	Inches	
C. Succirubra, No. 1 . ..	4	9	7	The largest leaf was 11×7 inches.
Do. „ 2 . .	4	9	6	
Do. „ 3.. ..	5	2	4½	Three large shoots rising from the stem.
Do. „ 4.. ..	3	10	5½	
Do. „ 5 . ..	....		....	Numerous shoots springing from the stem.
Do. „ 6. .	1	9	....	Sickly.
C. Officinalis, No. 1.. .	4	8	5½	Shoots on the stem. Tree covered with buds.
Do. „ 2.. .	5	0	5	Covered with buds and flowers. Many shoots on the stem.
Do. „ 3.. ..	4	5	4¾	Fine healthy tree.
C. Micrantha, No. 1.. ..	4	1	6¼	Stem divided into two near the ground.
Do. „ 2.. ..	....		....	Sickly, broken down by an accident.
Do. „ 3.. .	3	3	4¾	Sickly, died down, and shot up again.

23. I have already described the Pulney Hills, and have recorded my opinion as to their capacity for Chinchona cultivation both in my former Report, and more fully in my work. My present visit has not induced me to alter the views which I had then formed. As the trees of C. Micrantha were drooping, I recommended that they should be transplanted to the Kodakarnal shola, near a stream where tree ferns flourish. I have also supplied Mr. Levinge with a parcel of seeds of the C. Officinalis procured from Ceylon. This species will no doubt thrive well on the upper Pulneys, as will also the C. Pitayensis, the seeds of which have just arived at Ootacamund. C. Succirubra should be introduced into the lower Pulneys, where, however, very little pro-

gress has been made in coffee planting. The climate is too dry, and there is much fever. Mr. Sperschneider, formerly in the Forest Department, has about 40 acres of coffee in the lower Pulneys, at a place called Pali-mullay ; M Fontelerc, a Frenchman, has a small coffee garden ; and a short time ago Mr. Coyle, a Missionary had another. The Native villages are generally on round knolls, with fine jack and mango trees, surrounded by terraced cultivation, garlic, onions, potatoes, vendiam (Fenugreek) and some coffee. They are exceedingly picturesque, but are well within the fever range, and every house should have a few trees of the healing Chinchona near it, The difficulty is to find machinery for the spread of the cultivation. A Collector who takes an interest in the work can do much, an intelligent Subordinate in the Forest Department still more. On the Pulneys we now have a good beginning, and every prospect of satisfactory progress. There are the means of propagating to any extent in Mr. Levinge's nursery, and suitable sites for cultivation abound. I rode over a portion of the higher Pulneys, where there are several sholas of considerable extent with northern aspects at an elevation of 6,000 feet, are well protected from the strong winds of both monsoons, while they receive all the moisture that reaches the hills. We selected one as the best of all, in the direction of Manavanoor, which covers about 150 acres. I have since written fully to Mr. Levinge on the whole subject. On leaving the Pulneys, we passed by the villages of Vilputry and Pullanky, crossed the heights of Tallamalla, and went down a precipitous and rocky pass on foot, to the village of Pulney.

24. It only remains to say a few words respecting the Anamallays, which I regret to say I could not spare time to visit, though I enjoyed a grand view of them from Polatchy. Here there is an unlimited area for future planting, every species of Chinchona will flourish at the different altitudes from 7,000 to 3,000 feet, and in few places will the blessing of their presence be more felt than in the neighbouring Districts. The Native hospital at Polatchy within ten miles of the Anamallays, the beneficial effects of which already extend to all the fever Districts at the foot of the hills, will hereafter receive unlimited supplies of bark, and have the febrifuge manufactured on the spot. All this is in the future, yet a commencement has already been made in planting the Anamallays.

No. 180. From Clements R. Markham, Esq., to the Secretary to Government, Revenue Department, Fort Saint George, dated Bangalore, 7th February 1866.

1. With reference to paragraph 40 of my letter to your address,

dated January 16th, 1866, I beg, in continuation, to submit my conclusions respecting Chinchona cultivation in Wynad, after a personal inspection of every part of that District.

2. Along the ridge of western ghauts overlooking Malabar, several grand masses of forest-covered mountains rise from Wynad plateau, and terminate in well-defined peaks at elevations of from 4,500 to 5,500 feet. The most remarkable of these mountain knots are the Velery-mulla, the Chumbra, the Koocha-mulla, and the Balasore ranges, while the Bramahgherry mountains form the boundary of Northern Wynad. The sites best adapted for Chinchona cultivation are to be found along the more sheltered slopes of these ranges.

3. The present state of the undertaking, as regards Wynad, is not so advanced as I had hoped, and this slow progress is due to the practice of charging money for the plants, a large per-centage of which die on the transit, instead of distributing widely and without stint. Good progress has, however, been made on a few estates, and several planters fully intend to give the cultivation a fair trial.

4. The estates where Chinchona plants are now growing are as follows ; There are a few in the Ouchterlony Valley, and on the plantations of the Moyaar Coffee Company. On the Naikenshola estate, in Cherambody, Mr. Minchin has a nursery containing about fifty plants of *C. Succirubra*, two or three feet high, as well as several trees planted out, one of which is six feet high and five inches in girth. On two estates, called the Ellembellora and Panora Peaks, on the slopes of the Chumbra hills, several trees are growing most satisfactorily. The Ellembellora Peak estate, belonging to Mr. Hinde, has an elevation of three thousand and five hundred feet, with a western aspect. Seven trees were planted out in February 1864, and they now look very healthy, with leaves untouched by the landwind. They are of the *C. Succirubra* and *C Micrantha* species, and average a height of five to six feet and a girth of five to seven inches. Mr. Hinde expects a cooly load of plants from the Neilgherries in a few days, and he intends to form a plantation on the slopes of the Chumbra mountain, above his estates, at an elevation of about 4,500 feet. The Panora estate is at the northern end of the Chumbra range. Mr. Rossell, the owner, planted out several Chinchona trees in December 1863, at an elevation of 3,600 feet above the sea. Not a single drop of rain fell from three months after they were planted, and there are now twelve trees of *C. Succirubra* and three of *C. Micrantha* planted out, of which three of the former are cuttings struck on the estate. Their height is from five to seven feet, and girth six to seven inches. These two estates, as well as those

of Rimington on the other face of the Chumbra Hills, are admirably adapted for Chinchona cultivation, and I look forward to very satisfactory results from the future operations of their owners. On the Anapara estate, at the foot of the Chumbras, Mr. Fergusson has a fine healthy tree. It is worthy of observation that the rain-fall on these estates varies exactly as their aspect vary on the slopes of the Chumbra hills, with reference to the south-west monsoon. The following is a register of the rain-fall kept on the two estates where Chinchona trees are growing:—

Rain-fall on the slopes of the Chumbra hills (Wynad).

Month.	*Panora Peak Estate.*			*Ellembellora Peak Estate.*		
	1863.	1864.	1865.	1863.	1864.	1865.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
January, ...	1·14	0·00	0·00	....	....	0·00
February, ...	0·02	0·00	0·00	....	....	1·33
March, ...	5·43	0·00	0·72	....	....	0·45
April, ...	7·49	7·16	5·08	....	4·49	7·41
May, ...	5·53	5·30	7·98	....	8·44	9·37
June, ...	56·66	39·28	22·54	....	40·49	26·30
July, ...	35·84	54·68	79·60	....	69·39	97·98
August, ...	36·42	12·67	21·59	....	16·47	25·78
September, ...	7·00	7·77	5·42	....	10·02	5·41
October, ...	10·43	2·32	4·88	....	5·90	7·47
November, ...	1·14	1·60	4·77	....	0·78	4·62
December, ...	1·19	0·45	0·75	....	0·26	0·76

At Baliapara, on the Koocha-mulla range, there are several plants; and Mr. Richardson has a row planted, in hard gravelly soil, in front of the Cutcherry at Manantoddy. Finally, there are nine very fine healthy plants of *C. Succirubra* on the estate of the Bramahgherry hills, belonging to the Madras Coffee Company.

5. An estate of 300 acres, on the well-wooded hills above the Tiranelly Pagoda, has been applied for by Mr. Lowry, a planter and an excellent gardener, exclusively for Chinchona cultivation. Mr. H. Gordon, who is opening largely on the Bramahgherries and in the Tiranelly valey, has sent for 1,000 plants. Mr. Beaumont, the Managing Director of the South Indian Coffee Company, intends to form an experimental plantation at the foot of the Velery-mulla range, on the top and round the sides of a hill called Papdara. The plantation will cover about twenty acres, and will be sheltered partially from the south-west monsoon by the Velery-mullas, which tower above it. In short there now seems to be a prospect of a considerable extension of

Chinchona cultivation in Wynad and, while it will be remunerative to the planters, there will hereafter be supplies of bark for their laborers, growing on the spot. I beg, therefore, to suggest that Mr. Richardson, the Deputy Collector, be supplied with all reports and proceedings on the subject of Chinchona cultivation, and especially with one of the copies of Mr. Howard's work (*Nueva Quinologia de Pavon,*) so that there may be the means of reference for cultivators in Wynad.

6. But, although the extension of this cultivation on the estates of European planters is much to be desired, it is far more important that the natives of the District should be induced to open small Chinchona gardens in every direction, and in great numbers. The people suffer fearfully from fever. The scourge has appeared exceptionally early this season, and I have myself witnessed its ravages, while I am assured that later in the year the scenes, even on the public roads, are loathsome and heartrending. Much of this fearful evil might easily be mitigated.

7. The Chetties, Nairs, and Moplahs, who occupy land in Wynad, generally select elevated knolls for the sites of their dwelling, which are exceedingly picturesque. They are covered with jacks, mangoes, bastard sago palms, and plantains, and overlook the rich paddy cultivation in the flats below. In most of these sites Chinchona trees would grow well, and form another item in the garden produce of the people. The healing febrifuge would be at their doors, and the use of the bark would be extended to hundreds of slaves and coolies who now die and rot on the public roads for the want of it. The machinery for carrying out this beneficent measure is at hand. The Deputy Collector will gladly superintend its details, distribute plants, select the best persons as recipients, explain the importance of the measure, and endeavour to excite an interest in the cultivation. The experiment will cost little or nothing, while the good that may be derived from it is evident. An unspeakable blessing, such as only those who have witnessed the ravages of fever amongst the coolies can fully appreciate, will be conferred on the Wynad District.

8. I venture, therefore, to recommend this measure most strongly to the favourable consideration of the Governor in Council. In the first instance, about 500 strong young Chinchona plants should be supplied to the Deputy Collector at Manantoddy, and a small sum should be sanctioned for the cost of cooly hire, tools, and the preparation of a nursery. He would then be in a position to propagate and distribute plants, and to take all such measures as, in his judgement, will be most conducive to the great object in view.

No. 181. Minute by the Honorable the President.

(Here enter 9th February 1866.)

No. 182. Minute by the Honorable T. Pycroft.

(Here enter 14th February 1866.)

No. 183. Minute by the Honorable H. D. Philips.

(Here enter 1st March 1866.)

No. 184. Order Thereon, 10th March 1866, No. 617.

Miscellaneous.

1. Ordered that the Principal Inspector General, Medical Department, be requested, with reference to paragraph 3 of the Despatch of the Secretary of State, above recorded, to submit a list of the Medical Officers, whom, having regard to the qualifications mentioned in the Despatch, he would recommend for appointment to the proposed Commission. Dr. Shaw will also make such suggestions, as occur to him, for ensuring a decisive trial of the relative and positive qualities, as febrifuges, of the Chinchona alkaloids other than Quinine, specified in the despatch, and of the preparations, quininium, &c., alluded to by Mr. Markham.

2. The promised supply of alkaloids has not yet been received.

3. The Principal Inspector General Medical Department will be furnished with a copy of paragraphs 14 to 22 of Mr. Markham's Report and of G. O. 20th ultimo, Revenue Department, No. 460.

4. With reference to paragraph 32 of Mr. Markham's Report, the Government consider it desirable that one uniform price should be charged for plants, whatever number may be taken. Under the present arrangment, a planter requiring, say, 3,000 plants, gains by purchasing 5,000, and throwing away the surplus 2,000. Mr. McIvor will, therefore, in future charge one anna per plant in all cases. The Government do not concur witn Mr. Markham as to the gratuitous distribution of seeds and plants, but wish to have Mr. McIvor's opinion on the subject. In submitting this Mr. McIvor will state how many applications he has still on his registers, how he deals with applications, (whether by priority of date, extent of requirement or on what other principle), and how many of the 900, 000 plants in his possession are in a fit state to send out to private applicants, possessing only ordinary skill and experience in horticulture. The Government consider that there is much truth in the remarks contained in the 58th paragraph of Mr. McIvor's last annual Report, and apprehend that any such general distribution of delicate plants as Mr. Markham proposes would

be unsuccessful. They wish to know when Mr. McIvor will be in a position to furnish well grown plants in any considerable number.

5. The Collectors of the Districts marginally noted will offer such suggestions as occur to them on paragaaphs 35 to 40 of Mr. Markham's report.

Ganjam.
Vizagapatam
Bellary.
Kurnool.
Canara.
Malabar.
Coimbatore.
Salem.
Madura.
Tinnevelly.

6. The Deputy Collector of Wynaad will be furnished with a copy of Mr. Howard's work on the Chinchona and application will be made to the Secretary of State for a few more copies of this work. Copies of the Chinchona Manual, with the annual additions thereto, have been extensively circulated, and Mr. Richardson doubtless has these. If he has not copies will be sent to him.

7. Ordered that a copy of Mr. Markham's Reports be sent to the Government of Bombay, the Resident of Travancore and Cochin, the Commissioner for the Territories of His Highness the Rajah of Mysore, and the Chief Commissioner Central Provinces, with the remark that the Governor in Council will be glad to afford them any assistance that may be desired in extending Chichona culture.

8. These Proceedings will be reported to the Secretary of State.

(True Extract.)

(Signed,) J. D. Sim,
Secretary to Government.

To the Principal Inspector General, Medical Department.
To W. G. McIvor, Esq.
To the Board of Revenue.
„ Collector of Ganjam.
„ „ of Vizagapatam.
„ „ of Bellary.
„ „ of Kurnool.
„ „ of South Canara.
„ „ of Malabar.
„ „ of Coimbatore.
„ „ of Salem.
„ „ of Madura.
„ „ of Tinnevelly.

3.—REMARKS ON CAPTAIN HUTTON'S PAPER "ON THE REVERSION AND RESTORATION OF THE SILKWORM." BY CAPTAIN J. MITCHEL, SUPERINTENDRNT OF THE GOVERNMENT MUSEUM, MADRAS.

The passage in Captain Hutton's Paper with which my remarks are concerned is as follows :—

"In the introductory remarks to my Monograph on the Genus *Attacus,* I have shown, after Kirby and Spence and other authorities, that the gum from the reservoirs, being conveyed to the mouth by the constriction of certain muscles, passes through two small orifices in the lip, *and the two fibres thus formed, being taken up and twisted together by the hook-like processes in the mouth appointed to that office, become one fibre of Silk on coming into contact with cold external air.*" (The Italics are mine.)

Now it is quite certain the authorities referred to by Captain Hutton could not have examined, with sufficient optical assistance, Silk taken directly from the cocoon, or they could have seen that no such twisting takes place, but that the two filaments are laid side by side in the cocoon, and adhere together until separated by the solution of the gum in the process of manufacture. I have examined cocoons and reeled raw silks, contained in the Museum Collection, and have, in every instance, found a double filament. But in bleached spun silk the filaments are single, because the gum which held them together has been washed away in the process of bleaching.

I have only the introduction to Kirby and Spence, which does not contain the information referred to by Captain Hutton, but I am aware that other writers, upon whose authority we *ought* to be able to rely, have stated that the silkworm spins a single thread—such, for instance, as S. R. Jones at p. 297 of the first edition of his undoubtedly interesting work "A General Outline of the Animal Kingdom ;" Dr. Carpenter, at p. 110 of the Second volume of his "Zoology," "The Micrographic Dictionary," at p. 360 of the first edition, article "Spinning Organs ;" and there are probably other authorities that might be quoted who have said that the filament is single. A correct description of the way in which the Silk is deposited in the cocoon will be found at p. 200 of Adams Essays on the Microscope published nearly seventy years since.

It is, I believe, commonly, supposed that the silk spun by every species of silk producer, that is usually manufactured, is alike in form ; but that is not the case. All the ordinary silk that I have examined is cylinderical, or nearly so ; but the common Tussah silk from *Antheræa*

Paphia, is flat and I have satisfied myself that each filament consists of a large number of very fine fibres held together by some substance that makes it very difficult to separate them. I have, however, succeeded so far as to justify me in saying that the filament is compound and that the finest fibres I have obtained measure about $\frac{1}{35,000}$th of an inch in diameter.

The filaments spun by *Attacus Atlas* and *Actias Selene* also appear to be compound, but the structure is not so marked as in *Antheræa*, and I have not yet tried to separate their fibres.

The foregoing remarks on Tussah silk are founded on observations made some days since. I have just had time before closing this letter to re-examine some that have been in water for many days, and I find the filaments are gradually breaking up into their component fibres, and I hope they will eventually all separate and enable me to mount specimens for permanent record.

I have only to add that, having had occasion to write to Captain Hutton, I pointed out the mistake about the filament, and he said in reply, that if I had discovered the two filaments were laid side by side and not twisted, I ought to make the fact known, as at present the idea prevailed amongst Entomologists that the two fibres were twisted after issuing from the orifice in the lip.

(*Transactions of the Entomological Society of London, Vol.* II.)

4.—POONYET.

Whilst upon the subject of "Insect-homes," I cannot resist adverting to the substance, which is found in Burmah, and called *Pwai-ngnet* or *Poonyet.** It is a blackish resin, channelled with little chambers or cells, by some species of Dammar-bee, and is found in holes in the ground, and in hollow trees. This resin, or wax, is employed by the Burmese for caulking boats, and is constantly on sale in the bazaars. The resin which I have seen under this name is slightly fragrant and apparently identical with that of *Canarium strictum*, the honey-combed structure alone excepted. The latter resin is common in Travancore, in Southern India, and Mr. J. Brown, of Trevandrum, says that it exudes from cuts in the trunk of the tree, and seems to be a great favourite of several species of insect, specially of one resembling a bee called by the Hillmen *Kulliada*, which live in pairs in holes in the ground. It is singular that the same tree is common in Malacca, where it yields a black resin, and there also is found a honey-combed resin, which the natives call "Dammar Klotee," and which is said to resemble the *Pwai-ngyet*, although the cells are larger, and the resin blacker and harder. This substance I do not remember to have seen. Dr. Mason, of Rangoon, states that he forwarded some specimens of the insect, which produces the Burmese *Pwai-ngyet*, to Mr. F. Smith, and that he identified them with *Trigone Lœviceps*, which had been first received from Singapore. The conclusion, therefore, at which I have arrived is to the effect that the "honey-combed resin," of Pegu and Burmah is the natural resin which exudes from the bark of the Black Dammar tree *(Canarium strictum,)* channelled and perforated by the insect known in southern India as *Kulliada*, and which is also found at Singapore, as well as in Pegu and Burmah, and recognized by entomologists as *Trigona Lœviceps*, but whether the resin is perforated in its soft state, soon after it issues from the tree, or, if after it becomes hard, how the feat is accomplished is more than I am at present able to affirm. Perhaps some correspondent who resides near one of the localities indicated will institute inquiries, and render our information more complete respecting the economy of the Dammar Bee.—M. C. COOKE in 'Science Gossip.'

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* See Journal A. and H. Socy. of India, Vol. X p. 103 for some interesting particulars regarding this resin and the bee which produces it.—Eds.

Correspondence and Selections.

I.—THE PRACTICE OF IN-BREEDING.

ON IN-BREEDING VIEWED PHYSIOLOGICALLY.

(Continued from Page 128.)

TO CHARLES H. MACKNIGHT, ESQ.

MY DEAR SIR,—I have been very much interested in your letters on in-breeding, which have appeared from time to time in the *Economist*, and more particularly so with the one addressed to Dr. Black, of St. Kilda, published May 5th, 1865. The whole subject is one of great interest to the scientific physiologist, and of vast importance to the practical stockowner; and, as it seems to me that a good deal of prejudice and false reasoning are afloat concerning it, I have thought that you might be interested to know that, as usual, the largest and most extensive experience tallies exactly with the teachings of science. The question is a wide one, and capable of being viewed in many different lights; and I think I shall be able to show that the contradictory opinions held concerning it are distinctly traceable to this very fact.

We may safely lay down, as a well established physiological law, that *every creature is the exact product of its parents, inheriting the peculiarities of each, modified by the influence of all the differences which exist in the two parents.* For example, two exactly similar parents will produce offspring precisely like themselves, while two very differing parents will produce a compound being which is capable of endless variation. (I need not remind you that when I speak of differing parents I always refer to parents of the *same species*, and exclude altogether hybridation which is an entirely different question.) Practically we never find two parents so absolutely similar that no divergence occurs in their offspring, but we must always select the closest possible approximation when we wish to produce a *fac simile.* Before proceeding further, let us ask the question, what object has the stockbreeder in view beyond the mere numerical increase of his animals? Clearly this—He wishes to modify his animals so as to render them more perfectly adapted to his purpose, or he desires to perpetuate the good qualities they already possess. Now the purposes for which domestic animals are bred are very numerous, and hence the course followed by each breeder will differ according to the effect he wishes to produce. But, nevertheless, the one physiological law must be obeyed by all, viz, that "*Like begets like.*" On the very threshold, then, we are met with the question, where shall we find the nearest approach to likeness? Clearly in the members of one family. If two pretty similar parents produce a numerous offspring, you will be much more likely to find two very similar specimens in that one family than you will in two unrelated families. This, therefore, constitutes the first inducement to in-breeding, where it is desired to perpetuate some already possessed good quality. But every animal is a very complex being, made up of a vast variety of qualities and tendencies, and hence it is all the more necessary to seek resemblance within the one family, in order that you may guard against differences in the offspring. For example—You select two sheep for the fineness of their wool, and you breed from them to insure fine wool. Now, if these two sheep are already nearly related, you feel certain that they possess similarity, not only of wool, but of general constitution. Whereas, if they are not of the same family, one or other may be nearly related to a coarse-woolled sheep, and hence the produce may vary considerably in the character of their fleece. We now come to a second physiological law, which exerts an equally powerful influence on the results of breeding. It is this—*All organic beings are capable of modification in form, under the influence of selection.* Mr. Darwin, in his "Origin of Species," lays very great stress upon this fact, and however one may differ from his principal conclusions and speculations, there is not the least doubt that many of his statements are strictly according to fact. This law may be expressed as follows, viz., *Diversity begets variety.* And the interesting fact is, that the more frequently you unite differing parents, the greater is the amount of variety produced—so that ere long you obtain a breed so inclined to vary that you cannot in the least foretell what the result will be of any given experiment. Let us turn to the vegetable kingdom, and we shall find abundant evidence of this fact. In florists' flowers, variety of colour and form is the desired object, and gardeners find that by selecting two plants of the same species, differing materially in colour and form, and crossing these, you will obtain seeds which will produce not only repetitions of the parent flowers, but many specimens differing materially from both; and if the process of uniting two unlike flowers is repeated sufficiently often, you will have a literally endless variety of produce, and you then arrive at the point at which the seed is perfectly useless for the purpose of reproducing the likeness of the parent plant; the tendency to vary has become so inveterate that of 100 seedlings no two will exactly resemble each other. But gardeners are well acquainted with a process the very opposite of this. Let us suppose a case. Amongst a batch of seedlings one flower seems much more beautifully coloured and of finer form than any of the rest, and the gardener wishes to preserve and multiply this. If the plant is a perennial, he of course effects his object by cuttings, or layers, but as this process has no analogy in the animal kingdom, we will suppose the flower to be an annual capable of being raised by seed only. In this case the gardener carefully protects his selected flower from the pollen of any other individual of the same species, and, reserving all the seed, he raises it next year. Among the seedlings he will find many varieties, but he has a good chance of having some few which resemble the parent. These he at once selects and separates from the rest with the same care as before, and the next year he will find that this seed will produce a large per centage of seedlings resembling the originally selected flower. This plan being followed year by year, the tendency to vary is found at last to cease, and the seed comes true to colour and form. This process is termed *fixing a sport;* and a prettier example of the very closest in-and-in breeding could not be given. We have here, therefore, the two series of facts, viz.: that by selecting *differing parents*, you can increase the tendency to vary almost to infinity; and by selecting *similar parents*, you can get rid of the tendency to vary and produce a fixed form. The length of time required for either of these processes differs materially, some plant proving so much more ductile than others—but one thing is certain, that every repetition of judicious selection increases the tendency whether to fixity or the variety, as the case may be. Precisely the same series of phenomena may be observed among wild plants—those species which are very widely spread and capable of growth under various differing circumstances of climate, soil &c., are found to vary, and the accidental crossings of these varieties increases this tendency, so that the number of distinct varieties becomes very large. Whereas those species which occur in limited localities, and in small numbers, have almost always the closest resemblance to each other. Thus we have shown that selection is the means by which the stockbreeder can modify or fix the qualities of his animals; and we have further shown that *in-breeding* is the readiest and surest method of fixing the good points after he has obtained them.

Let us now see if this process of in-breeding is natural, or the reverse. If we examine the law of production in the vegetable kingdom, we find that the closest possible in-breeding continually prevails. In the vast majority of plants, the male and female organs co-exist in one and the same flower, so that the plant impregnates itself, and this process continues from generation to generation. If we look into the animal kingdom we find that low down in the scale true hermaphrodism largely prevails, and each individual is self-fertilising, as in plants. Among the higher animals, however, the sexes are always distinct, but still there is no visible check to the closest in-breeding. The nearest blood relations show no repugnance to copulation ; and in point of fact, in many instances seem naturally disposed to keep together. Stonehenge, in his "Rural Sports," refers to this. He says, at page 422, "Breeding 'in-and-in' prevails extensively in a state of nature with all gregarious animals, among whom the strongest male retains his daughters and grand-daughters until deprived of his harem by younger and stronger rivals. In nature we find about two consecutive crosses in the same blood the usual extent to which it is carried, the life of the animal being the limit ; and it is a remarkable fact, that in practice a conclusion has been arrived at which exactly coincides with these laws. 'Once in and once out' is the rule for breeding given by Mr. Smith in his work on breeding for the turf ; but 'twice in' will be more in accordance with the practice of our most successful breeders."

Before proceeding further, let us inquire what is meant by the term "breeding in-and-in?"

Loudon, in his "Cyclopædia of Agriculture," refers to three methods of breeding, viz. : 1. "*Crossing;*" 2, "*Breeding in the line*"—that is, within the limits of the family ; and 3, "*Breeding in-and-in,*" which Stonehenge defines in the following words,—"the paring of relations within the degree of second cousins twice or more in succession." ("The Horse," page 140.) Now, let us apply this definition to his example quoted above, concerning gregarious animals. We will suppose a young bull and several young cows of one family separate from the herd, and form a mob by themselves. The bull will probably hold the relation of brother or half-brother to most of the cows. He retains the family, according to Stonehenge, until his daughters and grand-daughters are among the breeding stock, and is then "deprived of his harem by younger and stronger rivals." But who are these rivals ? Undoubtedly, *his own sons*, since in many places the herds of wild cattle as a rule keep strictly together. Hence the next lot of offspring vary from the first merely by the fact that the new male has his mother and his aunts added to his sisters in the harem. A very little reflection will show that in these cases the rule is not, as Stonehenge expresses it, "twice in and once out," but literally "in-and-in for ever." Again, although viewed from the dam's side, you may trace first and second cousins in one herd, yet the sire being the same for all the greatest distance of relationship, is much nearer that of half-sister. But, in point of fact, I believe we are quite wrong in applying such terms at all to the mutual relationship of wild animals. No relation is recognised by themselves, except that of parent and offspring; and even this is totally ignored as soon as the young become independent.

To return to our examples.—In birds the same process of close in-breeding is found to a large extent. The pigeon generally produces two young ones at each nesting, and these are almost always male and female, which grow up together, and unless prevented, pair and breed together; so that for endless generations the pigeon has been the product of the union of brother and sister.

Among insects the same holds good. In the bee and the wasp the very economy of their life renders it inevitable, since the only males with which the queen can come in contact must stand to her either in the relation of brothers or sons.

Now, since in none of these instances is there any proof of deterioration of offspring, but on the contrary, *fixity of type* is the only result, let us examine the objections to in-breeding, and we shall find that they are all founded upon two series of facts, viz, first, upon what history shows us has been the effects of continued close intermarriages among men; and secondly, what has been observed to occur occasionally by the breeders of stock. As regards what history teaches us about human intermarriages, we may set it aside at once as wholly irrelevant—for this simple reason, that selection among men never has and never will be regulated upon physiological grounds, and hence the chance of fixing and perpetuating the tendencies to hereditary disease are so great that no sane man will argue in favour of consanguineous matrimony. Besides which, the moral objections far outweigh the physiological ones. Our domestic economy would be utterly destroyed were it not for the repugnance to close and incestuous intercourse which nature has implanted in us, and which admits of the free association of the sexes within given limits without risk.

As regards what has been reported as the occasional result of in-breeding among stock-keepers, I cannot do better than to leave that branch of the question in your and Mr. M'Dougall's hands. You have so clearly shown that the best flocks and the best herds, in fact, the best animals of all kinds have resulted from close in-breeding, that the conclusion is inevitable, that when the process seems to fail, the fault lies in *unwise* selection, not in too close in-breeding. We must not, of course, forget that *every* quality and *every* tendency is reproduced during in-breeding, and hence the bad as well as the good descends from parent to offspring. The greatest care is therefore required in selecting animals from which to breed, and in the absence of this care much harm may be done. All the ill effects, however, of injudicious in-breeding can never upset the manifest good which has resulted from the process, when wisely and judiciously carried out.

I can very well understand your great objection to any attempt at crossing the Merino sheep, You have shown that the present race of pure Merinoes have a pedigree of eighteen centuries, and that the present animal is the product of in-breeding during all that long period; hence you very properly argue that every effort should be made to improve the animals by careful selection *within the family*, but that the greatest care should be taken to avoid the introduction of foreign blood. This is most true, and leads me to another development of the subject, viz., the immediate result of the admixture of new blood in any well established strain. To understand this, we must recall what I have already remarked viz., that every characteristic and every tendency in a parent is transmitted to the offspring, and re-appears in it, unless checked by some opposing tendency inherited from the other parent. When, therefore, you cross a long established breed with another family, you literally commence a new experiment, introducing an element of uncertainty which may effect results during a series of generations, and you at the same time risk seriously the fixity of those very properties which you are most anxious to retain.

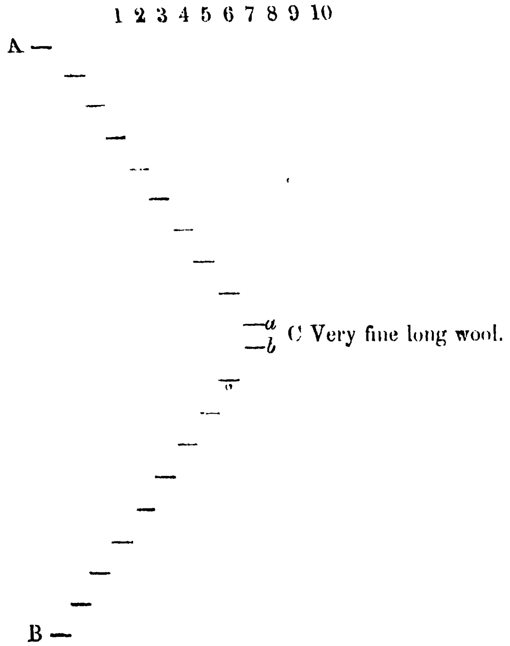
Let us take an illustration. The Australian Merino possesses very fine wool and a great length of staple, but it is by some alleged to be less close than the German family of Merinoes; some flockmasters, therefore, have endeavoured to increase the closeness of the fleece by crossing with the German, and, as I understand, they believe that they improved this point, but were disappointed to find that they at the same time reduced the length of the staple and sacrificed the manufacturing quality, thus losing some properties in seeking to gain others. Surely a much safer plan would have been to select from the flock of pure Merinoes individuals possessing greater closeness of fleece than the others, and, by breeding these together, you would effect the object, probably not so soon, but with far greater certainty, as you would be increasing closeness without introducing any other undesirable quality. I need hardly remind you that no family has its characteristics so absolutely fixed that the whole flock is built upon precisely the same model; you can always, therefore, select from a large flock individuals possessing the desired quality to a certain degree, and as every selection increases the tendency in the required direction, you cannot fail in time to produce any amount of modification, provided, of course, that there is no insuperable counter-agency at work. The history of Hallett's "Pedigree Wheat" will throw light on this subject. I am personally acquainted with Mr. Hallett, and have received from himself direct an account of the experiment. He selected a few fine grains of wheat, and sowed them in his garden, sufficiently far apart that he could examine the produce of each grain separately throughout its whole growth. He then selected, according to superiority, in all the following qualities: disposition to tiller—strength of straw— number and size of ears—number of perfect grains in each ear - form and plumpness in each grain, and lastly, having selected the best in all these points, he weighed them one against another and took the heaviest. This grain, or a few of the very best, he used as seed for the next season; and again the same extreme care in selection was carried out, and at length the result as you well know was an increase of size and productiveness which must appear perfectly marvellous to any one who is not acquainted with the extreme malleability of all cultivated creatures, be they plants or animals. I would here throw out a caution which should be carefully attended to by all breeders: *Do not give up selecting as soon as you have obtained the desired result*, otherwise you will find the breed gradually, but steadily, working back to the original type. Never forget, that however superior for special purposes the cultivated plants and animals may be as compared with the original types, yet in as far as they have been artificially modified, they must be viewed physiologically as being in an unnatural state, and directly in proportion to the amount of the modification will be the tendency to work back to the old type, if no selection is made.

I strongly doubt, for example, whether Hallett's "Pedigree Wheat" will stand the test of experience. If a field is sown with it, and the whole produce or an unselected portion of the grain is sown from year to year, I should fully anticipate that the increase of size and productiveness will steadily fall off, since a few crops (*i. e.* a few generations) is far too short a time in which to fix indelibly any new quality. We have a striking example of this in the domestic pigeon. Few species have proved so ductile in man's hand as the common rock pigeon of

England, which naturalists believe to be the original stock of the countless varieties of fancy pigeons of the present day. All pigeon-breeders, however, will tell you that the system of careful selection must be carried on steadily from generation to generation, and that with all the pains you can take you will constantly find birds that must be rejected because they have not come true to the new type. This want of fixity in the pigeon is undoubtedly due to the fact that the varieties are so far removed from the original type, and that no one variety has been sufficiently in-bred to secure what Mr. Randall calls the power to *mark offspring.* One very interesting fact in the pigeon has been pointed out by Mr. Darwin, viz., the tendency to the re-appearance in the young of the two bars of black feathers across the wings which characterise the wild rock pigeon. Surely this admits of only one explanation. We have already seen that the closest in breeding is natural to the pigeon, and hence, according to our physiological law, the power to *mark offspring* should be very strong in the wild bird and hence it follows that long after repeated crossing and selection has overcome the black bars, still the *tendency,* though unseen, exists, and you can never feel secure from its reappearance in the progeny of even well-selected parents.

We must here guard against an error which would certainly mar our argument unless it is constantly recognised. When speaking of the very great length of time required to fix any given quality, we must restrict our argument to those qualities consequent upon *artificial selection.* We must never forget the influence exerted by climate, food, or, indeed, by all the elements which go to form what Darwin so well terms *natural selection.* These influences being continually operative will produce their effect, and, so long as they are not counteracted, will establish themselves more firmly year by year Hence it follows that in each locality the modifications effected by natural causes will become more and more fixed *without our interference* ; whereas the modifications *which we ourselves endeavour to produce* by selection and in-breeding must be carefully watched and protected during a long period. It is easy to understand why this should be so. All the modifications connected with *natural selection* are for the purpose of rendering the animal *more adapted* to the circumstances in which it is placed, and nature's laws are framed with this design. But when man interferes with her ordinary course, and endeavours to modify an animal to suit some special purpose, it is reasonable to suppose that he must continue his care and supervision, so that, while acting according to physiological laws, without which failure would be inevitable, he may yet suspend or counteract those other laws which are fitted to regulate the undomesticated animal. It may be objected to by some that in my argument I have reasoned as if no varieties occurred naturally, but were all the result of man's interference. This, however, is by no means the case. I am well aware that most species vary within certain limits; in fact, all the difficulty experienced in defining species is owing to the fact that the possible limits of what may be termed natural variation are so hard to fix. But this does not interfere with the argument at all; or, rather, it strengthens it, since it will be found that the more a species is given to vary, the more difficult it is found to check this tendency; and, moreover, the only known method of accomplishing this object is by *in-breeding with selection.*

The history you have given us of the Spanish Merino is in beautiful accordance with the above teachings of physiology. You have shown that each family (Cabana) of the Merino has in process of time, by in-breeding alone, *without selection*, attained fixed characteristics, so that the families differ from one another owing to the modifications produced by climate, food, &c. You have further shown, that those who possess the longest pedigree have attained the largest power of *marking offspring*, and hence in 100 such sheep you may find ten better and ten worse than the average, but there will exist a very close resemblance among all. Lastly, you have noticed that the Rambouillet family, which only dates from 1793, and which originated from animals selected from *several different Cabanas*, have, in spite of in-breeding and selection, still retained the tendency to vary. In fact, several strains being united in one flock, no other result could have been expected. This fact can be rendered plain by a simple diagram



Let us suppose A and B are two very differing Cabañas of pure Merinoes, and let the flockmaster select with the greatest care, *within their own Cabaña*, the individuals having the finest and longest wool the result will of necessity be that the members of the two Cabañas, will approach in the character of their wool, until they very closely resemble each other at the point C. Now, breeders would be apt to think that it was very immaterial whether they united *a* and *b* for the next breeding or kept them apart, seeing that both flocks were equally pure Merinoes, and that the qualities of the wool were almost identical*; and yet a little thought will show that uniting the two flocks *a* and *b* might prove most disastrous in its consequences It must never be forgotten that A and B have travelled in different directions towards the improved condition, *a* and *b* and hence the tendency to fall back is in quite opposite directions in the two families. If, therefore, you unite the two flocks, and especially if after uniting them you trust to in-breeding alone, without most careful selection, you would run the risk of producing a flock of most irregular character containing varieties of every kind within the limits of A B C, and moreover, losing their power to *mark offspring.* On the other hand, if you keep the two families separate, any falling back which may occur will be in one direction only, and moreover the tendency to vary at all will become less and less, since close in-breeding developes so strongly the power to "mark offspring," or in other words to *fix the type.*

I will now refer to another evil result of out-breeding, which deserves especial attention. In the *Economist* for March 13, 1863, you give the pedigree of the bull "Shakespear," and show how intensely in-bred he was, and yet he proved an admirable and most prolific sire; and you then contrast him with the celebrated "Hubback" and his dam, and remark, that "neither of them were in-bred at all," and yet they "became barren at an early age, simply from the propensity to fatten." Bearing in mind what I have already observed that animals which have been artificially modified, must be viewed physiologically as being in an unnatural state, let us analyse this case, and see if we cannot give a probable reason for what took place.

"Shakespeare," intensely in-bred, and belonging to a family whose tendency to fatten had been artificially cultivated to such an extent that one-third less food was required for the purpose than with ordinary cattle, still did not grow morbidly fat, but retained his full powers during a long period.

"Hubback and his dam," not in-bred at all, but descended in both lines from herds wherein the tendency to fatten had also been encouraged, both became morbidly fat, and hence useless for breeding purposes. Here then, we at once perceive that in "Shakespeare's" family there must have existed some condition which held in check the fattening propensity, and prevented its becoming unhealthily abundant. Now, physiology teaches us that the formation and deposition of fat depends directly upon the reciprocal action of the liver and lungs, controlled by the action of the skin or the kidney; and we know also that the functions of these two organs are mutually antagonistic, in so far, that during health an increased action of the skin is associated with a diminished action of the kidney, and *vice versâ.* Hence it follows that there are two antagonistic checks to the fattening propensity; and this is the important point for breeders to remember. Let us suppose, for example, that in the "Shakespeare" family the fattening propensity was kept within healthy bounds by a free-acting kidney. Now, so long as the balance of the functions is kept up, all will go well. But suppose an animal of this family breeds with another where the tendency to fatten is kept in check, not by the action of the kidney but by that of the skin, what will be the probable result? The offspring will inherit an increased tendency to fatten as that pre-existed in both parents, but the checkstrings will be, loosened, seeing that the freely-acting kidney of the one parent, and the freely-acting skin of the other, so far from being increased by the union, will be actually diminished, as being physiologically antagonistic to each other ; and accordingly it follows, as a very natural consequence, that the propensity to fatten will exceed the bounds of health and the breeder's object be frustrated by his stock becoming barren. How true it is, that every attempt to go out of the direct line in breeding is surounded by unknown and often unavoidable dangers.

In conclusion, I think it has been shown that *in-breeding is the natural method of retaining special qualities*, while out-breeding, or the union of differing parents, *is the equally natural method of obtaining entirely new characters ;* and hence stock-breeders must adopt the first or second course, according to what they wish to effect. At the same time, if they already possess animals having *some well-established good qualities*, they must content themselves with the apparently slower process of selecting within the family, since the introduction of foreign blood may mar the whole experiment. Of course if a flock or herd has already been spoilt by repeated crossing, and has lost all special characteristics, the only course to be adopted is to select a first-rate male of *long pedigree and pure blood*, and commence a fresh experiment, selecting the best females, and then following up the closest possible in-breeding, so as to fix by degrees the desired type. This is undoubtedly a very slow process, and many disappointments must be anticipated ; still, it is the only way to success, when a family of long and pure pedigree is not to be obtained.

I have already extended this letter beyond the limits I originally anticipated, but the subject grows upon one, and its importance cannot be over estimated. I trust, therefore, that many others may be induced to enter the field, and that we shall ere long see old prejudices overcome, and a throughly natural and scientific process of breeding adopted.

I need hardly remind you that *breeding in-and-in* has neither advantages nor disadvantages *per se*. That is to say, if we knew of any method by which to detect all the *tendencies* in an animal as well as its visible points, we might then select indiscriminately ; but seeing that there is no known way of ascertaining an animal's *inherited properties* except by its pedigree, and seeing that no two unrelated families have identical properties, we are practically driven to select *within the family* as the only means of securing a *fixity of type.*

HENRY R. MADDEN, M.D.

ST. KILDA : *June* 13*th*, 1865.

(Proceedings of the Acclimatisation Society of Victoria.)

IMPROVEMENT OF COTTON BY PURITY OF SEED &C. BY MAJOR TREVOR CLARKE.

MY DEAR SIR,—The Consular reports of cotton-growing in Greece and Turkey, in your last issue, together with those from the Brazils, contain points of high interest, as showing under what circumstances American cottons can or cannot be grown in a general way. There can be very little doubt but that, soil and situation being fairly favourable, the question turns mainly upon the water supply, whether this be furnished by natural rains or artificial irrigation. The quantity of water that the cotton plant will take during the growing and flowering period, when cultivated here as a stove plant, is almost incredible, far surpassing that required by any other plant that has come under my notice during many years' attention to horticultural pursuits. I must however, remark that no plant suffers so much from imperfect drainage, or sudden checks to root action of any kind.

It appears also that the New Orleans is better adapted for general cultivation in these Levantine countries, than the black or naked-seeded breed, represented by Egyptian and its finer form, Sea Island. This would seem to indicate the advisability of trying the hybrid, or rather cross-bred plant, obtained between these two races, which has already shown good results, as you can testify, in India. But it must be borne in mind that neither this, nor any other improved sort, will remain free from what is called degeneration, unless kept up to the mark by occasional introduction of seed grown at some distance and interchanged.

It is certain that American cotton when grown in other countries suffers a change after a generation or two, and finally, if not ill cultivated as to rotation of crop, &c., attains to and remains at a certain standard or normal state of constitution and qualities due to the influences exercised by the climate into which it has been transported. It does not, however, as far as I have seen, depart from its type in any botanical particular. My plants from Dharwar seed were longer in the boll, more hairy, and shorter in staple than pure American New Orleans, but much the same in other particulars. The Italian and Sicilian cottons grown under the names of Siamese, Castellamare, and Hirsutum are certainly New Orleans altered by long cultivation in temperate European countries; *and where such cottons thrive, good new Orleans would thrive also.* It may not be here out of place to remark that degeneration, from growing continually the same seed, in the same district, is not peculiar to cotton.

Another fact of great interest appears to be gradually coming out, to wit, that Sea Island *can* be grown elsewhere than in its celebrated quarters, when a sufficient amount of good cultivation has been bestowed upon it. The production of this staple in Italy is especially interesting.

The correspondence from Brazil points to the fact that old and worn sugar and coffee plantations will be maiden soil to cotton, and that good New Orleans and Sea Island are already in bearing, with a railway in progress to carry the produce to the coast.

But I must now turn your attention to a fresh subject, already, however, alluded to in my former letters, namely, the use of pure seed, to be effected by the rigid isolation of sorts. Next to a constant supply from any indicated source, the manufacturer requires a *constant quality of staple.* From accounts I have received, from credible eye-witnesses, the mixture of sorts in a cotton-field, especially in the West Indies, is inconceivable, the crop in some instances looking like a flower garden with different sorts, sizes, and colours. In one case my informant described the not unfrequent appearance of a red blossomed sort evidently the Indian G. Arboreum, in his fields.

This is the work of the native labourer, who is either incapable or unwilling to see the difference between right and wrong, at any rate where his own interests are not concerned. His delight seems to be in reversing, confusing, or nullifying especial orders the moment the master's eye is off, and the mixture of seed is generally his preliminary operation. In my own experience I rarely receive unmixed samples, and wrongly named sorts are continually sent home, although probably in good faith as far as concerns the sender.

The one and only remedy for this will be found in English skill, science, and energy, strongly exerted in this one direction. Experimental farms, at the expense of, or encouraged by Government are nothing new; for a century or two these have been carried on spite of the perversity of man as well as that of the elements, and have borne their fruit. My modification, however, of the system would be this: *Let such establishments be entirely devoted to seed farming,* the sole effort being restricted to the production of pure seed in the country where it is destined to be grown in future. In this country no grower of seed, either for agricultural or gradening purposes, would now obtain a sale for his produce were he to supply his customers with mixed or inferior seeds. In the establishments of such persons the master himself goes through his crops several times a year for the purpose of destroying every plant which proves inferior or untrue to sort. This weeding process is technically and expressively called "rogueing" the crop, and is absolutely necessary to ensure purity and high quality. At the same time improvement by special selection is carried on; single plants showing high qualities are picked out for propagation, and the produce of these submitted even more rigidly to the same treatment.

The success which has attended the production of pure acclimated exotic seed has been sufficiently proved in the Dharwar district of India and would, doubtless, lead to the same results elsewhere upon a like system. It is probable, moreover, that the increased amount of trouble would prove to be laid out to profit, and show the beneficial results which invariably follow the employment of skilled labour. There is little doubt that private speculations of this kind would be very profitable. Fresh seed, in the case of exotic sorts, should be occasionally procured; and, where such refinement can be effected, this and the acclimated sort should be intercrossed, which would assuredly tend to keep up the standard of excellence in staple. In India the improvement of the native Gossypium Indicum and Arboreum might be carried on in stations set aside for the express purpose, and the capabilities for this race thoroughly tested. Here I might suggest the reintroduction of the Indian plant, in its acclimated state, from the temperate countries back into India again. The plant I allude to is the low-growing, obtuse-leaved, and more herbaceous form of Gossypium Indicum, cultivated and known by the name of "Native" in Greece, Turkey, and still more temperate climates; choosing of course the best acknowledged sorts cultivated in these places. I have examined and grown many specimens of the kind alluded to, sent to me from the Association. They are all of the same type, and the best closely resemble some fine Dhollerah communicated by Dr. Forbes Watson from the India Museum. Persons conversant with agriculture will understand the drift of this suggestion—that of growing plants in a suitable climate from seed raised in one which is less favourable. Again, the Beraree and Dacca forms, extremely distinct from the last mentioned, might be introduced into Europe as a new field for experiment. The Bourbon, or "Wild Cotton" as it is called in the West Indies, has actualy naturalised itself in India. Now there are several sorts in these Islands, allied to or derived from this plant, which should be well worthy of trial in India on this account. The staple is somewhat scanty, but silky, often naked-seeded, and of the Sea Island character. I hope shortly to produce some hybrids of this race for trial. They are, in fact, produced and growing, but, though crossed with the early-bearing Sea

Island, they have taken the late fruiting character of the Bourbon parent, and I have not yet ripened a boll. This cotton would be much more grown in the West Indies were the staple more plentiful. I hope I may have effected such an improvement in the cross. In the meantime I have sent a few seeds out to the West Indies, and am awaiting the result. I am happy to say that a really scientific man, Dr. Imray, has taken up the subject of cotton improvement in the West Indies; judging from his first results, I think we may look for some magnificent cotton from Dominica. In Antigua the subject has been warmly taken up by the able and intelligent Governor of that Island, and I believe by this time some of my favourite and best hybrids are growing in his garden, as well as in that of the learned doctor in Dominica.

To return to our subject. The necessity of introducing establishments of this kind in new or neglected countries is evident from the difficulty experienced in procuring seed that can be depended upon—in plain words, that will *grow* when planted and prove *true to sort when it is grown.* There have been more instances than one in India where total failure was announced, nay, as it were, trumpeted to the world, where the only reason for want of success was simply that the seed would not come up. Ill-packed and uncared for on the voyage, or worthless in the first instance, it failed to germinate; and so "American cotton" was "unsuited for this district!" Moreover, I know an instance where seed was purchased and sent out to a fine cotton-growing country, wrongly named as to two or three at least of the samples, which wrong names are now established in that district. Thus we are liable to be told that such or such a sort of cotton is unsuitable to the country, when the subject alluded to is altogether another kind. Three distinct kinds are sent out under the name of Egyptian, and the same thing occurs, even to a greater extent, in the case of Pernambuco and Peruvian. *Careful seed farming would lead to correct nomenclature,* and the manufacturer would at least know what he was buying.—*(Cotton Supply Reporter, September* 1866.*)*

3.—REPORT ON THE CULTIVATION AND GROWTH OF THE MAHOGANY TREE, (SWIETENIA MAHOGANI) IN BENGAL. BY DR. T. ANDERSON, SUPERINTENDENT, ROYAL BOTANICAL GARDENS, CALCUTTA.

WITH reference to the orders of Government contained in the Junior Secretary's endorsement No. 2779 of the 24th July 1865, I have the honor to state that great success has attended the introduction of the Mahogany tree into the Botanical Gardens. Several of the trees, originally introduced in 1795 from Jamaica as young trees, were destroyed in the great Cyclone of 1864, when the trees were probably seventy-one years of age from the time the seeds producing them sprouted. These trees had, in that time, attained a very large size, averaging about 12 feet in girth at 4 feet above the ground. A log taken from one of these trees, and consisting merely of the trunk to the commencement of the first branches at a height of 13 feet above the ground, gave, after squaring and removal of the sap wood, 169 cubic feet of timber. This log has not been sold yet, but two offers have been made for it, ranging between 4½ annas and 5 annas for the superficial foot 1 inch thick, or about Rupees 600 for the entire log. In the Calcutta Timber Market Report which appeared shortly after the sale, the following report was given : "country wood refers to a public sale, held on behalf of Government, of trees blown down in the Botanical Gardens during the 1864 Cyclone. The Mahogany brought extreme prices, and so did the Sissoo, both descriptions being much wanted by the trade." I understand that the Mahogany was found by the original purchasers to be of so good quality that a considerable profit was obtained in selling it by retail.

2. My multifarious duties have hitherto prevented me compiling from the records of the Botanical Garden a report on the progress of the cultivation of Mahogany in Bengal, and I have therefore availed myself of the offer of Assistant Surgeon Dr. James Cleghorn, who volunteered to draw up a precis of the information on the subject from the records of my Office. He also undertook the measurement of all the Mahogany trees standing in the Garden in December 1866, in the same manner as I did in January 1864. This report and two appendices by Dr. Cleghorn I now submit, as embodying all the information I can give on the introduction and cultivation of this valuable timber tree.

3. The numerous trees of Mahogany in the neighbourhood of Calcutta, both in private gardens and along public roads, all obtained

from the trees in the Botanical Gardens, shew that the successful growth of the tree here is not to be ascribed to any skill on the part of the native gardeners or to peculiar care taken of the trees. I believe the Mahogany tree is one that might as easily be spread over all parts of Bengal as the Larch has been in Britain, as the tree thrives equally well in the alluvial clay of lower Bengal and the dry laterite soil near Bhaugulpore. The only obstacle to the extension of the cultivation of Mahogany is the difficulty of procuring sufficient quantities of seed. The trees in the Botanical Gardens produce only a very small number of capsules, containing a few seeds, (from 10 to 30.) These seeds do not long retain their vitality, and accordingly seeds have rarely been distributed from the gardens. The introduction of the plant in the distant parts of India has thus generally been effected by seedling plants, a most expensive but very certain way of introducing new trees. I think that large numbers of plants of Mahogany could be produced by artificial propagation (by cuttings and layers) as has been done in the case of Chinchona, and although plants obtained by this process never make such good timber trees as those raised naturally from seed, still tolerably well-formed trees of Mahogany artificially propagated, and now 56 years of age, are growing in the Botanical Gardens, and have trunks varying from 7 to 10 feet in girth.

4. If it is considered advisable to prosecute vigorously the introduction of this tree into all parts of India, I would recommend that in the first instance reports should be obtained of the present size of the large number of trees distributed to all parts of India from 1813 to 1843. The age of these trees is now sufficient to permit of a reliable opinion being formed of the amount of success which has attended the growth of Mahogany in India generally. There can hardly be any question about the tree succeeding well in at least the Sikkim Terai and over Assam, Lower Bengal and Chittagong. If large supplies of seed properly packed can be sent annually from Jamaica by the West Indian Mail, and direct from Southampton to India without any detention in England, then a sufficient extent of plantations could be formed in a few years in the Sikkim Terai. At the proper season this year, I shall practically test the artificial propagation of the plant; if large numbers of cuttings can be easily made to produce roots then a large area of ground could be planted by young trees raised from cuttings. These, if planted closely together and judiciously thinned and pruned would eventually produce almost first class trees. The seeds from the West Indies should be packed in dry pounded charcoal, a layer of capsules containing the seeds alternating with a layer of

charcoal, and in this method of packing the box should be as air-tight as possible. For the sake of experiment, one box should contain seeds without the capsules, but also packed in charcoal. It would be as well to send a small quantity of seeds packed securely in paper alone without any box. The seeds should be taken ripe from the trees, and should be packed dry, but without being exposed to the sun. All unnecessary detentions should be guarded against, especially at Southampton. If possible, the seeds should be transferred from the West Indian Mail steamer to the steamer of the Peninsular and Oriental Steam Navigation Company. Two dispatches of seed from Jamaica might be made according as the seeds ripen, in case the first dispatch fails. The cases of seeds should be addressed to me, and advice of their dispatch from the West Indies should be sent to me *via* Marseilles and Bombay.

5. If the report I now submit is published and widely distributed, and especially if officers to whose districts Mahogany trees have been sent in former years for public purposes are requested to report on the number, size and condition of any Mahogany known to exist near them, more information on the growth of the trees in various parts of India might be obtained.

Report on the cultivation and growth of the Mahogany Tree (Swietenia Mahogani) in Bengal.

Introduction of the Tree.—In an old catalogue of the plants in the Botanic Gardens, Calcutta, compiled by Dr. Roxburgh, the Mahogany Tree is mentioned as having been introduced into the Gardens from the West Indies in the year 1795. Dr. Roxburgh in a letter dated 29th February 1796 to C. Shakespeare, Esq., Sub-Secretary to the Government of Bengal, mentions, among other things, that "the Mahogany plants sent out by the Court of Directors in 1794-5 thrive very well." These are the earliest notices, concerning this valuable tree, to be found in the records of the Botanical Gardens. These plants sent out by the Court of Directors, were the first introduced into India, and as late as 1836 every Mahogany Tree in the country was certainly derived from these, either by cuttings or seeds, and I believe until August 1865 there were no new introductions. In 1865, 183 pods containing 8235 seeds were received from the Government of Jamaica, on requisition by Dr. Thomas Anderson, Superintendent, Botanical Gardens, and these were taken from trees grown in that

Island. The pods were packed in three boxes, two of which were ventilated, and the third air-tight. The seeds in the former (6235) were received in apparently good condition, while those in the latter (1980) were quite mouldy; all were, however, sown on the 7th August 1865 and on the 18th of the same month they began to germinate; but in the end only 460 plants were produced, and these were from the seeds in the ventilated boxes, those in the air-tight one having entirely failed; 338 of these plants were sent to Darjeeling to be planted in the Terai, and the remaining 112 were kept in the Botanic Gardens.

Cultivation and Growth.—In 1796, one year after the planting of the trees in the Botanic Gardens, Dr. Roxburgh sent a few young plants to Mr. Fallowfield of Madras, who planted them in his garden. In a report written three years afterwards (1799) Dr. Roxburgh says of these that "they are thriving well," and with regard to the plants originally sent out in 1795, he writes, in the same report, that "they thrive exceedingly, and have multiplied to some hundreds, and that this useful tree is perfectly at home here, and, I may venture to say, that it is also fairly established in India" Dr. Wallich, Superintendent of the Gardens, in his Annual Report of 1836 to the Government of Bengal, writes that "the Mahogany grows as well in Bengal as in its native soil, and though inferior in the fineness of the grain to the Domingo Wood it is at least equal in quality to that of Jamaica;" so that the plant having been originally introduced from that Island had not deteriorated by the change. In appendix A. I have placed, in a Tabular Form, the distribution of Mahogany plants from the Botanic Gardens, Calcutta, since the year 1802. A total of 5,548 plants have been distributed in the Bengal Presidency; of these 2,863 were supplied for planting in public gardens and on roads, &c., and 2,685 were given to private individuals both European and Native; 251 of the former received 2,469 plants, and 46 of the latter received 216; 67 plants were sent to the other Presidencies and Provinces not situated in the Bengal Presidency; 4 plants were sent to Europe and 9 to Africa. No information whatever has been received regarding the growth of any of these plants. In addition to the above Dr. Wallich in 1837 sent a quantity of seeds to Tenasserim, and in 1842 large quantities of seed were sent to the Ceylon Government, both by Drs. Wallich and Griffith. Again in 1846 Dr. Wallich presented a "few papers of Mahogany Seed and also a box made of Mahogany Wood grown in the Botanic Gardens, to the Agri-Horticultural Society. The Society planted some of the seeds in their own garden and the remainder they disposed of among their members. In 1856 the Society gave "100 fine healthy plants," to the Agent, East Indian Railway Company, on his own requisition, for the purpose of being planted along the line of Railway. These plants were raised from seeds gathered from trees belonging to the Botanical Gardens. In 1864 the Agent of the Railway Company was asked for information as to the progress and condition of the plants. He only reported on ten of them, viz. :

At Serampore Station, ...	2
" Chandernagore Station, ...	3
" Hooghly Station, ...	5
Total ...	10

and these, he said, " were in a flourishing condition, about 12 feet high and 15 or 16 inches in diameter."

The growth of the trees in the Botanic Gardens has been very satisfactory. In 1864 there were 69 trees of large size growing in the garden besides numerous small ones, averaging 1 feet in diameter. Many of the former were blown down by the Cyclone of 1864, and when they were examined the roots of the majority of them were found to be more or less decayed, owing, in all probability, to the richness and dampness of the alluvial soil in which they were planted. The dimensions of the largest tree now in the Botanical Gardens are as follows:—

	Ft.	In.
Circumference at 4 feet above ground	14	3½
Ditto ,, 5 ,, ditto	14	2
Ditto ,, 6 ,, ditto	14	2
Length of Bole	13	0
Extreme height of Tree	150	0
Spread of Branches..	102	0

and the following are the dimensions of a log at present lying in the gardens, cut from one of the trees blown down in the Cyclone :—

	Ft.	In.
Length..	13	9
Mean Breadth	0	51
,, Depth	0	34
Cubic Contents	169	2

To contrast with the above I shall here give the measurements of the largest log cut in the Honduras up to the year 1830—

	Ft.	In.
Length	17	0
Breadth	0	57
Depth	0	64
Cubic Contents	430	8

In appendix B. I have given the measurements of some of the trees blown down in the Cyclone of 1864, and also of all the larger ones at present growing in the gardens. The particulars regarding the former I obtained from an unpublished report "on the probable age of trees as estimated by the number of their concentric rings," by Dr. John Anderson, Curator of the Imperial Museum, Calcutta.

Value of the Botanic Gardens Mahogany.—The Mahogany box presented by Dr. Wallich in 1846 to the Agri-Horticultural Society, along with an unmanufactured specimen of the wood, were ordered by the Government of Bengal, to be sent to Messrs. Shearwood and Company, for them to express an opinion as to the quality of the wood. They reported "that if it had stood for a few years longer it would have been equal to Honduras Mahogany." The age of the specimens at that time could not have been more than forty-nine years, whereas Honduras Mahogany is not considered fit for cutting until it is two hundred years of age.

One hundred and thirty cut logs and several lots of uncut ones obtained from trees blown down in the Cyclone, were sold by Messrs, McKenzie, Lyall and Company in February 1866, and fetched the ordinary market price of Mahogany.

The above facts show that the Mahogany Tree, although planted in a low-lying rich soil, with little or no drainage, has succeeded admirably in this climate, and that a wood has already been obtained whose marketable value is equal to that of any other Mahogany exposed for sale in the Calcutta market.

As little is known of the general characters of the Mahogany Tree, I may mention that those in the Botanic Gardens flower during the rainy season. The seeds ripen in March. The usual number of seed capsules for each tree to bear is four to five, but this number has, in one case, amounted to thirteen,—this prolific tree was struck by lightning about fifteen years ago. Each capsule contains from ten to thirty seeds. Since March 1864 the trees in the Botanic Gardens have produced no seed, although during last rainy season the show of flowers was abundant.

Sir Wm. Hooker in the Botanical Miscellany says, that in Honduras the tree is generally cut about 10 or 12 feet from the ground, and that the trunk, on account of its size, is deemed the most valuable, but the limbs or branches are prepared for ornamental purposes, the grain of them being much closer and the viens more rich and variegated. The quality of the wood, it is said, greatly depends on the situation where the tree grows, being of a superior grain and texture in elevated stony ground, lighter and more porous, and of a paler colour, in low and alluvial situations.

In St. Vincent, where the Mahogany is not indigenous, the tree does not attain a greater height than 50 feet and a diameter of 18 inches.

APPENDIX A

Tabular Statement *of the distribution of Mahogany Trees* (Swietenia Mahogani) *from the Royal Botanic Garden, Calcutta.*

GEOGRAPHICAL DISTRIBUTION OF THE MAHOGANY TREE (*Swietenia Mahogani*) PROPAGATED FROM THE PLANTS INTRODUCED INTO THE ROYAL BOTANIC GARDENS, CALCUTTA, IN 1795.							RECIPIENTS OF PLANTS IN THE BENGAL PRESIDENCY.						
Date of distribution.	Distribution of Plants in India.			Distribution of Plants.		Total number of plants distributed.	Public Gardens, Road, &c.		Private Individuals.				Total number of Recipients.
	In the Bengal presidency.	In the other Presidencies and countries contiguous.							Europeans		Natives.		
		Number of plants.	Names of places to which the plant was sent.	Number of Plants.	Places to which the Plant was sent.		Number of Plants.	Name of Garden, &c	Number of Plants.	Number of Recipients.	Number of Plants	Number of Recipients.	
1802	20	..	....	...	....	20	..	....	20	7	...	...	7
1803	9	...	....	...	....	9	...	....	9	3	...	...	3
1805	7	...	....	...	....	7	...	....	7	2	...	...	2
1806	2	2	Madras	...	....	4	...	....	2	1	...	...	1
1807	7	...	....	...	....	7	...	....	7	3	...	...	3
1808	8	...	....	..	....	8	...	....	8	3	...	...	3
1812	68	..	....	..	....	68	..	....	68	11	...	...	11
1813	650	...	...	8	St. Helena 6 Mauritius 2	658	26	The city of Agra 20 Jaggernaut Garden 6	608	23	16	2	27
1814	235	...	....	12	St. Helena ..	247	..	....	235	16	...	...	16
1815	192	4	Bombay	5	Prince of Wales Island 2 Australia 3	201	20	Public Road at Serampore	166	27	6	2	30

816	46	..	....	8	Isle of France ..	54	16	Barrackpore Park 6 Botanic Garden, Saharunpore 10	30	9	..	..	11
817	66	..	....	...	....	68	..	....	66	12	..	..	12
818	95	14	Nepaul 10 Rangoon 2 Bushire 2	..	....	111	..	....	95	12	..	..	12
819	45	4	Madras ..	9	St. Helena 2 Australia 7	58	..	....	37	7	8	2	9
822	20	..	....	..	....	20	..	....	20	3	..	..	3
823	52	6	Kumaon ..	..	....	58	6	Ranisserpore plantation ..	42	8	4	1	10
824	36	..	....	..	....	36	20	Gazeepore ..	16	2	..	..	3
826	31	..	....	.	....	31	..	....	31	5	..	..	5
827	38	2	Vizagapatam ..	..	....	40	...	....	28	3	10	2	5
1828	36	4	Pondicherry ..	.	....	40	..	....	28	6	8	3	9
1830	8	..	....	..	.....	8	..	.....	8	2	...	..	2
1834	12	..	....	..	....	12	..	....	12	2	..	..	2
1835	87	.	....	..	....	87	..	....	80	6	7	2	8
1836	225	.	....	..	....	225	..	....	225	6	..	..	6
1837	190	8	Tenasserim ..	2	Gardens, Ceylon	200	..	....	104	10	86	1	11
1838	99	6	Assam 2 Aracan 4	.	....	105	..	....	77	7	22	4	11
1839	25	3	Assam ..	..	....	28	6	Avenue, Dum-Dum ..	15	2	4	2	5
1840	..	..	....	..	....	6	..	....	.	..	.	...	..
1841	12	..	....	..	....	12	..	....	12	1	..	..	1
1842	144	..	....	..	....	144	..	....	144	9	..	..	9
1843	138	2	Aracan .	..	....	142	52	Govt. House, Barrackpore	80	10	6	2	13
1848	8	4	Akyab ..	..	....	10	..	....	8	2	..	..	2
1849	5	..	....	..	....	5	..	....	3	2	2	1	3
1850	5	..	....	..	....	8	..	....	4	2	1	1	3
1851	26	..	....	.	....	26	..	....	19	9	7	3	12
1852	37	..	....	..	....	37	.	....	16	4	21	11	15
1853	29	..	....	.	....	29	..	....	24	2	5	4	6
1854	4	..	....	.	....	4	..	....	1	1	3	3	4

4.—NOTES ON A SUBSTANCE CALLED "PUTTOO MANGA" OR WHITE ANT MANGO. COMMUNICATED BY DR. J. SHORTT, TO THE AGRI.-HORTICULTURAL SOCIETY OF MADRAS.

I have the honor to bring to the notice of the Agri-Horticultural Society that much interest has been excited of late in England, among *Savants*, about a substance found in the burrows of the white ant, and which is known by the Tamil name of "*Puttoo Manga*" or white ant mango. It is frequently found to exist among ant-hills in Travancore, the Western Coast and Coimbatore. The first specimen sent Home from this country was by Dr. Waring, who, on opening the centre room of his house at Travancore, for the purpose of building two walls, and on digging to the depth of three feet below the surface, found several holes scooped out in the earth, perfectly smooth and circular, and of a sufficient size to admit a man's hand, and he observed hanging down from the sides of these cavities several clusters of dark-colored fruit-like looking bodies of various sizes and shapes, and on exhibiting them to native practitioners, it is said that they eagerly took possession of the greater number, calling them "Puttoo Manga." It appears that these are found, though rarely, under the foundations of old buildings, and that they are believed to be either formed or produced by white ants; they are in high repute, and greatly sought after as medicinal substances. Such was the account that accompanied the only three specimens that were in possession of the Pharmaceutical Society of London in 1860, and being the contribution of Dr. Waring. These specimens were immediately submitted to the Reverend Mr. Berkely who possess a wide reputation as a Microscopist, and who pronounced them to be of a fungoid nature. This has since been confirmed by Messrs. Currie and Hanbury in a paper read before the Linnæan Society on the 3rd May 1860.

These substances are also known to the natives by the name of "*Puttoo Rai,*" or "*Mail Manga.*" It is found to be rather common in the Malabar and Coimbatore Districts, that is, perhaps one, out of every fifteen or twenty ant-hills explored, may produce this growth; but it is not found in the Carnatic, and which may be accounted for by the greater dryness of the climate in these parts, and the absence of that moisture and heat so necessary for fungoid growths. The natives state that it is occasionally met with in dark crevices, and in the recesses of rocks and caves, but my experience does not confirm the latter fact as yet.

Dr. Pulney Andy and Mr. W. Karney, my Assistants, have, at my request, obtained for me several specimens from the Malabar and Coimbatore Districts, and to them I am indebted for such information as they could procure in these Districts.

A large contribution of Puttoo Manga specimens have been since forwarded by me to England, and I herewith beg to submit others for the inspection of the Society. Messrs. Currie and Berkely have given this substance the scientific name of "*Sclerotium stipitatum.*" The latest account received from England states that Mr. Berkely now doubts its being a fungus at all, but the specimens I have forwarded may tend to settle the question. Some natives state that these fungoid growths are only met within old and deserted ant-hills, after the insects have become winged, and then only in the peripheral and more superficial caverns, springing from the roofs, occasionally from the floor, but never from the cells occupied by the ants themselves. They take on various forms, such as oval, oblong, pyriform, and irregularly round, &c., with the addition of long stalks, while others are again stalkless. Those with stalks can be traced beneath the soil, while the stalkless seem to lie over the soil. It is believed that they attain their greatest states of prefection during or immediately after the rains. The external rind of these substances is black and slighty wrinkled ; on cutting into them, the interior is found to be white and pithy, and is compared by the natives to the kernel of a tender cocoanut ; it is both tasteless and inodorous.

The Malaylum Vithians, who are also familiar with this growth, believe it to be manufactured by the insects themselves, by a kind of accretive process, and it is further said that snakes are fond of it, and devour it greedily ; while others again believe that it is not a vegetable substance, but a conglomerate mass of the larvæ of white ants.

The rude tribes found inhabiting the jungles and hill sides of the Districts, where these growths are quite familiar with, and attribute to them poisionous properties. Native-like, each one differs in the description of the properties and qualities ; nevertheless the Vythians eagerly seek it, and use it as a remedy in cholera, syphilis and a variety of other diseases. It is believed to be a specific in cholera, and is administered by rubbing it up with a little water, fresh ginger juice or country arrack, the dose being frequently repeated.

I believe that a full-grown specimen of this fungus has not been found as yet, and its true nature is still doubtful, but there is reason to believe, from the habit and structure, and also from the fact, that it attains the greatest perfection during, and immediately after, the rains, that it must be allied to fungoid growths, and it is possible that further research during this particular period may tend to the discovery of perfect specimen, with the organs of fructification fully developed.

It is interesting to learn that anything found in the nests of the white ants should have excited so much curiosity among learned *Savants*. The Pattoo Mango having been only discovered lately, there is sufficient ground for gentlemen interested in the subject to trace the growth to its full size, so as to place its fungoid character beyond the possibility of all doubt.

I bring the subject to the notice of the Society, solely with a view of drawing attention to it, as it is possible that it may possess some valuable remedial properties; and as the natives believe it to be a specific in cholera, this alone, if proved true, will attach to it a value and interest not to be equalled by anything else of the kind.

I trust that the subject will be experimented on, in all its bearings, and as regards its medicinal value. Independent of this, full-grown specimens, with the organs of fructification fully developed, will enable Savants to determine more readily its nature and properties.

MADRAS:
19*th July*, 1866.

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Thornton's Gazetteer of India,	1	,,

Monthly Proceedings of the Society.

(Wednesday, the 17th of January 1866.)

A. GROTE. ESQ., *President, in the Chair.*

The proceedings of the last Monthly Meeting having been read and confirmed, the Members proceeded, in accordance with the Bye-Laws, to the election of Officers and Council for the current year.

The President nominated the Rajah Suttashurn Ghosal Bahadoor and Mr. R. Blechynden to act as Scrutineers, who reported the result to be as follows:—

President.—Mr. A. Grote.

Vice Presidents.—Baboo Gobind Chunder Sen, Mr. S. P. Griffiths, Baboo Seebchunder Deb, and Mr. W. Stalkartt.

Secretary.—Mr. A. H. Blechynden.

Council.—Mr. J. Agabeg, Mr. C. E. Creswell, Mr. T. H. Mosley, Mr. J. A. Crawford, Mr. A. Sawers, Dr. Thomas Anderson, Mr. S. H. Robinson, Dr. Fabre Tonnerre, Mr. S. Jennings, Major W. N. Lees, Baboo Peary Chand Mittra, and Cowr Harendra Krishna.

STANDING COMMITTEES.

The revision of the Standing Committees was next entered on, and the names of the following Members were added where vacancies had occurred, *viz*:—

Cotton.—Mr. E. G. Buskin. *Fibres.*—Mr. H. Knowles. *Implements.*—Messrs. T. W. Bayes, and S. H. Robinson. *Grain.*—Mr. A. S. Sawers. *Nursery Garden.*—Mr. S. Jennings. *Fruit and Kitchen Garden.*—Mr. Sawers. *Translation.*—Cowr Herendra Krishna. *Tea.*—Mr. S. P. Griffiths. *Correspondence.*—Mr. Sawers.

ANNUAL REPORT.

THE Secretary read the Annual Report.

The President expressed his regret that the Report which had just been read, again noticed the absence of co-operation of the native Landholders with the objects of the Society.

Rajah Suttashurn Ghosal observed, that he thought the Report should be translated and published in the Vernacular Newspapers, and named a resolution to that effect, as well as for the adoption of the Report,—which was carried unanimously.

The ordinary business was then proceeded with, and the following Gentlemen proposed at last Meeting, were duly elected Members:—

Dr. C. Prentis; Messrs. J. R. Reid, c. s.; and F. S. Growse, c. s.

The names of the following Gentlemen were submitted as Candidates for election:—

Captain H. A. Prinsep, Officiating Assistant Resident, Nepaul,—proposed by the Secretary, seconded by Mr. Grote.

Captain J. T. Tovey, Executive Engineer, Cawnpore,—proposed by Mr. F. Halsey, seconded by Mr. Grote.

George Meares, Esq., Indigo Planter, Sindooree, Jessore,—proposed by Col. J. R. Abbott, seconded by the Secretary.

George A. Glascott, Esq., Indigo Planter, Laucknutpore, Kishnaghur,—proposed by Col. Abbott, seconded by the Secretary.

Rajah Kristindo Roy, of Bolichar, Rajshaye,—proposed by Baboo P. C. Mittra, seconded by Baboo S. C. Deb.

G. O. Beeby, Esq., Solicitor,—proposed by the Secretary, seconded by Mr. J. Agabeg.

F. Hyndman, Esq., Pilot Service, Calcutta,—proposed by Mr. H. J. Joakim, seconded by Mr. S. Jennings.

Dr. Daniel Wright, Residency Surgeon, Nepaul,—proposed by the Secretary, seconded by Mr. Grote.

The following contributions were announced:—

1. Memoirs of the Geological Survey of India,—*Palæontologia Indica*, No. 4-1,—presented by the Superintendent.

2. Report of the Agricultural and Horticultural Society of Western India for 1864,—from the Society.

3. Annals of Indian Administration, Parts 3 and 4, of Vol. 9,—from the Government of Bengal.

4. The Annual Report of the Board of Regents, 1863, and Results of Meteorological observations, under the direction of the Smithsonian Institution, from 1854 to 1859,—from the Smithsonian Institution.

5. The Journal of the Boston Society of Natural History, Vol. 7, No. 1, and its Proceedings Nos. 1, 2, 3, and 21, of Vol. 9,—from the Society.

6. A quantity of Orchids from Monghyr,—from Mr. C. B. Wood.

7. A box of Liliaceous Bulbs from Japan,—from Mr. T. H. Mosley, on behalf of Mr. R. B. Parr, of Hong-Kong.

8. A quantity of Ohio Tobacco Seed,—from Dr. Forbes Watson.

9. Plants of Verbenas, Rondeletias, &c.,—from Mr. P. Raymond.

10. A Sample of Brick Tea from Bhootan,—from Mr. Grote.

11. A piece of Munnipooree Cloth,—from Mr. F. M. Bland.

Mr. Grote exhibited an unusually large sample, upwards of 3 feet in length, of a Yam, grown in his Garden—the *Guraninpa Aloo*—(*Dioscorea rubella?*)

A report was submitted from the Gardener on the case of Rose plants forwarded by Messrs. Vilmorin Andrieux & Co., of Paris; of the total number (319) received, 23 are dead, and some more may die afterwards.

Another report was read from the Gardener on the Cereals from the Cape of Good Hope, recently received per *Gondola.* These have all germinated most freely, but it is very doubtful whether they will retain their vegetative power till the proper period for sowing in October next.

Read the following report, from Mr. W. Manning, obtained by Dr. Forbes Watson, on the sample of "China Grass" received from the Punjab Agricultural Society, and referred to in the proceedings for July last:—

"We have carefully examined the sample. It is prepared in such a manner that we could hardly identify it as China Grass, and, in its present state, we do not consider it suitable for this market: it appears to have been roughly bleached, but manufacturers always prefer having fibres, of all kinds, in an undressed condition, and treated as simply as possible. We would, therefore, recommend shippers to send China Grass, and all other fibres, in the rough state, as *clean*, *long*, and good colored as possible; not in any way dressed or bleached, as it becomes thereby often quite useless for the English manufacturer, who prefers to prepare it himself. China grass is now in good demand, we sold yesterday at £75 per ton, nett cash, and the stock here (about 4 to 500 tons) is chiefly held for £80 to £85 per ton. There is at length a prospect of some thousand tons per annum being wanted shortly, as it is used largely by manufacturers of Damasks, &c., in place of Silk. The quality of Grass coming from Singapore and India is much preferred to that of China, the latter being sometimes partly bleached to improve the appearance."

Read also the following report from Mr. E. Taylor of the Goosree Cotton Mills, on the samples of Nankin Cotton and Cloth from Muttra, received from Mr. J. A. Loch, and referred to in the proceedings of the last meeting:—

"In reference to the small sample of Nankin Cotton, which you gave to me a short time ago for examination, I now offer my opinion upon it. But in the first place I would remark, that it is very difficult to say what might be expected in the bulk from so small a sample.

"It has a fine staple, but is *very weak*, should class it as an inferior Cotton, and value it at the same as ordinary to low Bengal Cotton. It appears to me to be overgrown, and like a great deal of Cotton grown in India, seems to have suffered from want of proper cultivation and irrigation; if it was attended to in this particular, it would, I believe, materially add both to the length and strength of the staple. The piece of cloth accompanying it, if made from it, is decidedly satifactory as regards strength, but even with the Cotton as it now is, is capable of considerable improvement in regularity."

Letters were read:—

From James Cowell, Esq., Brighton, dated 5th December, respecting the "Touat" Cotton tree, alluded to in a previous letter submitted at the Meeting in August last.

"As regards the 'Cotton of Touat,'" writes Mr. Cowell, "I find now from my friend at Algiers, that the Director of the Garden has assured him that no such Cotton tree exists, and that the wicked Frenchman who circulated the story as to its dimensions, &c., was hoaxing some traveller from France and England, who had gone to Algiers for some of the indigenous Cotton Seed or Plant in Southern Italy and Sicily. Mr. Hardy, the Director, pronounces the whole to be a "farce," and uses stronger language. The British Consul had prepared a long despatch for his Government on the alleged superiority of this Cotton, and was undeceived, I understand, just in time to prevent him from sending it to England. I thought all along that there must be some exaggeration about this reputed Cotton."

From the Secretary, Smithsonian Institution at Washington, returning thanks for certain copies of the Journal of this Society.

From Samuel Jennings, Esq., London, dated 11th December, enclosing Mr. Paul's invoice of 6 cases of Rose plants.

These consists of 77 varieties, and 358 plants in all, just received per Steamer *Mooltan*

From Secretary, Government of Bengal, forwarding 6 copies of Mr. Walton's Circular on Dr. Forbes' new Lever Cotton Press, and stating that every attention will be paid at the Dharwar Factory to all requisitions for these instruments.

The Council reported that they had fixed on Saturday, the 27th January, as the day for the first show.

The Secretary reported the receipt of a small quantity of Tea Seed from Cachar, which is available for Members.

For the above communications and presentations the best thanks of the Society were accorded.

Wednesday, the 21st February, 1866.

A. Grote, Esq., *President, in the Chair.*

The Proceedings of the last Monthly Meeting were read and confirmed.

The following Gentlemen were elected Members:—

Captain H. A. Prinsep, Captain J. T. Tovey, Messrs. Geo. Meares, G. A. Glascott, G. O. Beeby, P. Hyndman, Rajah Kristindo Roy, and Dr. Daniel Wright.

The names of the following Gentlemen were submitted as candidates for election:—

The Deputy Commissioner of Sumbulpore,—proposed by Major W. Nembhard, seconded by the Secretary.

F. G. Girardot, Esq., Telwaree Tea Plantation, Gwaldum, near Almorah,—proposed by the Secretary, seconded by Mr. R. Blechynden.

Baboo Jogendronauth Mullick, Zemindar, Andool,—proposed by Baboo Peary Chand Mittra, seconded by Baboo Shib Chunder Deb.

Major T. W. Mercer, Deputy Commissioner, Sealkote,—proposed by the Secretary, seconded by Mr. Grote.

Arthur Foy, Esq., Grantee, Oude,—proposed by Mr. R. J. Carberry, seconded by the Secretary.

Mr. John Scott, Head Gardener of the Royal Botanic Garden, Calcutta,—proposed by the Council as an Associate Member.

The following contributions were announced:—

1. Memoirs of the Geological Survey of India, Part 3, vol. 4 and Part 1, vol. 5. *Pâlæontologia Indica*, 4-1, and Catalogue of Organic Remains belonging to the *Echinodermata*,—by the Government of Bengal.

2. Papers and Proceedings of the Agri-Horticultural Society of the Punjab, from August to December 1865—by the Society.

3. Papers by the late Cotton Commissioner,—presented by P. Saunders, Esq.

4. Journal of the Asiatic Society of Bengal, Part 2, No. 4,—by the Society.

5. Report of the Committee, Bengal Chamber of Commerce, May to October, 1865,—by the Chamber.

6. Tea Planting at Darjeeling; will it pay? (10 copies),—presented by the Author.

7. Reports on the Hydrabad Assigned Districts, for 1864-65; on Oude, on the Punjab, Straits' Settlements, British Burmah, and North-West Provinces; and reports on Coorg and Mysore, for 1863-64,—presented by the Government of Bengal.

8. Five hundred Questions on the Social condition of the Natives of India: by the Rev. J. Long,—presented by the Author.

9. A glazed case of Plants from Sydney,—presented by Messrs. Guilfoyle & Son. These have arrived in fair condition.

10. A large collection of Orchids from Cherra Poonjee. Collected by C. K. Hudson, Esq. These have also arrived in good condition.

11. A small box of Hallet's Pedigree Wheat,—from Dr. Forbes Watson of the India Museum.

12. Twenty cards (2 kinds) of Japanese Silk Worms' Eggs,—presented by R. B. Parr, Esq., of Hong-Kong.

The greater portion of these Eggs have unfortunately hatched during the voyage.

Read the following Reports of the Judges on the Show of Vegetables, Fruits, and Flowers, held in the Sailors' play-ground on the 27th January:—

Horticultural.—Though not equal to the Show of last year, this may be considered altogether a fair Exhibition.

The *Brassica* tribe were well represented. The Cauliflowers were very fine in quantity and quality: this remark is applicable to Cabbages, of the Savoy in particular; of Brussell's Sprouts, there were a few fair specimens; and curled Greens very good, large and well curled; of Brocoli but a few baskets, but pretty fair, of the Cape purple kind. Of Endive a few good specimens, but chiefly small. Lettuces good but small. Carrots of all kinds were good, including the white variety. Knole-Kole very fine and in large quantity. Onions and Leeks good. Potatoes of various kinds shewed very well. The Peas were not quite up to the mark; the great drought of the past 4 months had doubtless affected them. Of Turnips there was a fine display of various kinds, and in large quantities. Radish, few and indifferent. Of Beet, some good baskets were placed on the stands, but nearly all very highly colored. In the collection of Beans, the French kind was very fine, and in quantity; of Windsor, a few, but very fair, were shewn; of Lima also a few but indifferent. Some baskets of indifferent Asparagus were submitted. The Celery was good but small, owing to want of rain. There were fair collections of Herbs, including fine Parsley from English stock. On the last occasion the gardens of several Mofussil Members exhibited; on this occasion, Mr. Thomas Savi of Moisegunge, Kishnaghur, was the only one who submitted some good vegetables, and obtained several prizes.

Among the indigenous vegetables, Cucumbers, Capsicums and Maize were all well represented. There were also many baskets of Beans of various sorts, exceedingly well arranged; and some good specimens of Ginger.

In the department of fruits, some fine Sapotas, Pine Apples, a small basket of green Mangoes, and Rose Apples were submitted. The Guavas were tolerably fair, and there were a few good Pomgranates, and several baskets of exceedingly fine Bael.

About one hundred Gardeners were present, and Prizes amounting to Rs. 285 awarded to forty-five, as per list annexed.

PEARY CHAND MITTER.
ALEXR. S. SAWERS.
CH. FABRE TONNERRE.
C. E. CRESSWELL.

Floricultural.—Though this Show was by no means equal, either in number of plants or in variety, to the Exhibition of last year, yet, considering the unusual drought experienced during the last four months, it was, altogether, as good as could be expected.

The collection of Roses was more limited than usual, but there were some well grown specimens, and two new kinds, "Prince Leon" and "Queen Victoria," the former from Mr. G. Livesay's garden, and the latter from Dalhousie Square. Eight gardens competed, and prizes were awarded to seven, to the extent of Rs. 37. Mr. J. A. Crawford's gardener carried off the prize for the best collection, and Captain Patterson's gardener for the second best collection; the prize for the best collection of cut specimens was awarded to Mr. S. P. Griffith's gardener.

The Camellias came next in order. The collection was tolerably fair. The same remark is applicable to Geraniums; these shewed much better than last year. To Mr. Manley's gardener the prize was awarded for the best collection, consisting of 20 plants and 10 kinds; and to Mr. Colin Campbell's gardener for the second best collection of 17 plants of 9 kinds.

Of Orchids there was no display, but two fine specimens of *Vanda cerulea* were submitted from the gardens of Mr. Grote and Major Raban.

Begonias, Oxalis, Verbenas and Portulacas were fairly represented. The first prize for Begonias was awarded to Captain Patterson's collection of 16 plants consiting of 12 kinds. Of that deservedly favorite flower, *Euphorbia Jaquiniflora*, there were many well grown specimens; better than have been seen for several years past.

Baboo Bindabun Chunder Mitter's gardener gained the prize for the best collection of Bulbs, in which were included *Lachenalia bicolor* and a *Sparaxis*. Some well grown plants were also shewn, under this head, of *Eucharis Amazonica*, and of Gloxinias. Mr. Griffith's gardener carried off a prize for the first and Mr. Grote's gardener for the second.

Of the Composite family there was nothing worthy of note. The Pinks and Violets were poor, and the Heartsease indifferent, with the exception of two specimens, to which prizes were given.

From Captain Patterson's garden came a fine collection of plants of Caladium, containing 10 kinds, for which a prize was awarded. A good collection of well grown plants of Tropœolum was placed on the stands, and several well flowered specimens of Balsam out of season.

The Ferns were better represented than at any previous Show; prizes were awarded for the three best collections to the gardens of Rajah Suttyshurn Ghosal, Mr. Schmidt, and the Hon'ble Mr. Beadon. To Captain Patterson's gardener a prize was awarded for the best collection of plants with variegated foliage.

Thirty gardens competed and prizes were given to 24, to the extent of Rs. 183, as per annexed list in detail.

Thos. A. C. Firminger.
G. W. Bartlett.
John Anderson, m. d.

A report from the Gardener was submitted on the consignment of Rose plants, from Mr. Paul, of Waltham Cross, the receipt of which was noticed in last month's Proceedings. The consignment consisted of 378 plants, containing 80 kinds. Of this number, 96 were found dead on arrival, and many have since died; leaving about 100 live plants only at the present time, several of which are also sickly. Agreed, that, as this mortality has been occasioned by Mr. Paul sending young and immature plants, he be requested to send another invoice, next cold season, free of charge, except carriage and such like incidental expenses. The consignment from Messrs. Vilmorin Andrieux & Co., of Paris, which was reported on at the last Meeting, has resulted much more favorably, the majority of their plants being of a more mature age.

Letters were read from :—

The Under Secretary, Government of India, enclosing copy of the following report from the local Honorary Agents of the Manchester Cotton Supply Association, on some samples of Cotton the growth of British Burmah :—

No. 1. Cotton grown in the Rangoon Cantonment from Lucknow acclimatized N. O. Seed, fully retains the characteristics of original stock, and represents a most useful description, of good color, fair staple, and strength of fibre; Home value about that of middling Orleans, say 20*d.* per lb. on 8th December last.

No. 2. The produce of Egyptian Seed sown in Rangoon Cantonment, likewise resembles original stock, but is somewhat irregular in length of staple and strength of fibre; otherwise a very desirable description, and worth about 21*d.* per lb. in the Home market.

The abovementioned specimens of Cotton are returned as requested; a small quantity being retained for transmission to the Cotton Supply Association, together with report from the Officiating Conservator of Forests, British Burmah, relative to entire failure of Cotton experiments, 1864-65, in the Myanoung District, which is much to be regretted.

From F. Schiller, Esq., Senior, respecting the useful properties of Tea Seed Oil :—

"Allow me to make you the following communication, which may be of interest to you. Baron Liebig, in Munich, writes me that he has carefully analysed some Tea Seed Oil, which I sent him at his request, some months ago. He finds that it cannot be discolored by the usual means, therefore, it is not fit for nourishment, and that it cannot be used for burning; but he has made out of it a very superior soap. With soda, he produced a soap of the color of Palm soap but much harder; with pottass, he produced a soft soap, without smell, and of a light brown colour; both qualities being very superior for cleaning purposes. He is of opinion that this Oil may become bye and by an article of Trade."

From Secretary, Acclimatisation Society, Melbourne, respecting the attempts at introducing China Sheep :—

"The Sheep that have been already introduced from China, are quite useless; and it was thought that the Ongtie breed might be better, but no definite steps have been taken in the matter."

From T. B. Bayley, Esq., Cape of Good Hope, respecting the probable success of some kinds of Indian Wheats in South Africa :—

"Some of the Indian Wheats are likely to turn out useful here; one kind, the *soft Egyptian* (sent from the N. W. P.) has everywhere stood against the rust, and has produced a fair crop, even in the late trying season. There has scarcely been any harvest, and the Wheat has suffered severely from rust. The *Oats* also are now showing the disease, which never appeared before in that grain."

From Col. Phayre, returning thanks for a box of Cachar Tea seed, forwarded for trial in British Burmah :—

"Pray accept my best thanks for the trouble you have so kindly taken regarding the Tea seed. I have great hopes that it will prove the foundation of Tea culture in British Burmah. Upper Burmah, we know, is a splendid Tea country."

From Secretary, Royal Horticultural Society of London, returning thanks for certain copies of Journal.

From Messrs. James Carter & Co., acknowledging receipt of order for the coming season's supply of seeds, and promising it their best attention.

Mr. G. Lawson submitted for inspection a self-acting Rotary Fan or Revolving Punkah Machine, together with descriptions of the Machinery to which the self-acting principle is applicable. Mr. Lawson offers these for public inspection and manufacture.

For the above presentations and communications the best thanks of the Society were accorded.

Wednesday, the 21st March 1866.

A. Grote, Esq., *President, in the Chair.*

The proceedings of the last Monthly Meeting were read and confirmed.

The following Gentlemen were elected Ordinary Members :—

The Deputy Commissioner of Sumbulpore, Baboo Jogendronath Mullick, Major W. T. Mercer, Messrs. F. G. Girardot and Arthur Foy.

Mr. John Scott, Head Gardener, Royal Botanic Garden, was elected an Associate Member.

R. F. Stevens, Esq., Manager, Hazrapore Concern, Jessore, was proposed as a Member by Mr. W. G. Deare, seconded by the Secretary.

The following contributions were announced :—

1. Geographical and Statistical Report of the District of Tipperah,—by the Government of Bengal.

2. Cinchona Cultivation in India,—by the Author.

3. An Account of the Cultivation and Manufacture of Tea in India, by E. F. Bamber,—by the Author.

4. A small box of Hallett's Chevalier Barley,—from Dr. Forbes Watson.

5. Two samples of Cotton raised in the Jail Garden at Hazeerabaugh, one from acclimatized New Orleans Seed, the other from stock unknown,—received from Dr. R. Banbury.

(Referred to Committee for report.)

6. Specimens from three several strata of submerged jungle wood, obtained in digging a well at Ballygunge, at depths of 25, 34, and 40 feet,—presented by R. Sears, Esq.

It was agreed to send portions of the above to the Geological Museum, and to the Asiatic Society's Museum.

Supplementary reports were submitted from the Gardener on the Roses received from Mr. Paul and Messrs Vilmorin Andrieux & Co., shewing much mortality since the hot weather has fairly set in. Of the former, there are only 103 plants alive, and of the latter 247.

A report was also submitted on the trial of the Hallett's pedigree Wheat, recently received, shewing a germination of 90 per cent.

TEA CULTIVATION IN THE HIMALAYAN RANGE.

A communication from Major J. G. Hathorn, R. A., dated from Hope Town, Darjeeling District, 25th February, was read:—

The above letter elicited some discussion, at the close of which the following proposal by Mr. S. H. Robinson, seconded by Baboo Peary Chand Mittra, was put to the Meeting and agreed to.

That the Society endeavour to procure information as to the average yield of Tea per acre in the principal Tea Districts, specifying the yield from plants of different ages, from three year to six year old plants, the results of the actual experience of planting in the different Districts.

JAPANESE SILK.

The Secretary brought to the recollection of the Members present the receipt of a small box of Japanese Silkworms' Eggs, containing 10 cards of green, and 10 of white Eggs, which were presented by Mr. T. H. Mosley at the last Meeting, on behalf of Mr. R. B. Parr, of Hong-Kong. On opening this box it was found that, though a good proportion of the Eggs had hatched, the majority of the worms were still living, and it was resolved that no time should be lost in turning this acceptable present to the best account. The following letters, which he would now read, would shew what had been done since the last Meeting towards carrying out this resolution:—

Note by Mr. C. E. Blechynden.—"With reference to the box of Silkworms' Eggs which you handed over to me on the 22nd ultimo, as having been received from Japan, I found, on examining the contents, that a good many had hatched. I took some 4 or 5 thousand for the purpose of rearing, and now beg to submit, for the inspection of the Meeting, a spinning frame with the cocoons attached. The worms are much larger than the "Burro Poloo," their average length at maturity being 2½ inches; they are very hardy; as the result of cocoons being spun in Calcutta, in an open room, with all attendant disadvantages goes far to prove. I am disappointed in the size of the cocoons, but their produce yielding qualities far outstrip any cocoons that I have seen reared in Bengal.

The eggs I received had hatched very irregularly, and the ages of the worms varied much. This has led to the crop coming to maturity at different times extending over a period of 6 days. The first cocoon spun was on the 15th instant. The time of feeding has also been longer; some of the worms are still continuing to feed. There is one feature in these worms I must notice here, it is their total immunity from the attacks of flies; no crop of Bengal worms could have been reared in the exposed manner these have been, without being totally destroyed by fly larvæ. On the spinning frame will be seen some large specimens of cocoons; these are double or made by two insects in the same cell.

I may, perhaps, be able to furnish a few additional notes respecting these worms at the next Meeting, having despatched some of these eggs to a native at Radnagore, who is largely engaged in the rearing of silk, and requested him to give me, in due course, the result of his experiments.

I may add, that, at your request, I selected from the same box such of the eggs as appeared least likely to hatch quickly, and packed them in a manner the most suitable for a long journey. Those were addressed to Dr. Bonavia at Lucknow; Capt. Hutton, Mussoorie; and Dr. Henderson, Secretary A. & H. S. at Lahore; and I hope they have reached their destination in an uninjured condition."

Note by Dr. G. Henderson, Secretary A. and H. Society, Lahore.—"The Japanese Silk eggs reached me safely. Some had hatched, but the young worms were alive and looking lively."

Note by Dr. E. Bonavia, Secretary A. and H. Society, Lucknow.—"The Japan eggs arrived all right, hatched, and are doing well, more about them hereafter."

Note by Captain T. Hutton, Mussoorie.—"The Silkworms' eggs arrived in very good time; a few had come forth but were alive, and now they are getting on well enough, having continued to hatch daily by a dozen or two since the first inspection. They are yet too small to enable me to say what they are, but they bear a very close resemblance to the young worm of the Boro Pooloo, being, when first hatched, of a dull brown hue, the anterior segment pale, and the head black. The anal horn or tubercle appears to be too short for *B. Mori*; but, as I said before, they are yet too small to enable me to decide."

In connection with the above the Secretary submitted the following extract of a letter from Mr. Jackson, Manager of Messrs. Lyall Rennie & Co.'s Filatures at Berhampore, dated the 8th March, reporting on some Japanese Eggs which were sent to him in the early part of February.

"A month having elapsed since I got up the two boxes of Japan Silkworm eggs, I will now send a first report on same.

Box No. 4 } Each containing 500 sheets, well and carefully packed, and ar-
" " 17 } rived in capital order.

On opening the cases some of the eggs were found to have already hatched, so I lost no time in distributing the sheets (thick pieces of card-board somewhat larger than this sheet of paper) on which the eggs were, to the different Factories and rearers of cocoons with instructions for them to furnish weekly reports of what progress was made.

For the first 15 days or so, no more eggs hatched, and I feared the attempt was not going to turn out successful, however, as the weather began to get warm and by putting the eggs for 20 minutes or so, in the *morning's* sun, they have nearly all matured, though at very irregular intervals, which I cannot account for. For 15 days past, eggs are *daily* hatching, consequently some of the worms are nearly half grown, while others are quite young, and at least one quarter of the eggs, though alive and good, still unbroken. The worms are strong and healthy, capital feeders, and bid well to be quite a success; time, however, can alone shew what will be the eventual result."

A few specimens of the cocoons spun at Berhampore were placed on the table; they are similar in appearance to those raised here.

Specimens of cocoons raised in France last year from Japanese stock were also submitted rather smaller than the above. Cocoons from Italian, Cashmere, and Bengal stock were also placed on the table for comparison.

The Secretary further brought to notice an article on this new trade in Silkworms' eggs, which is published in the *Japan Times Overland Mail*, of the 17th January. As this contains some interesting particulars in respect to the different varieties of eggs, it was resolved that it be published with the proceedings of this Meeting.

The following is the article in question :—

"The almost new trade in Silkworms' eggs which will form an important item in the exports of the year, deserves more than a passing remark. Induced by the success of experiments made during the two previous seasons, French and Italian houses sent agents here in such numbers as to change materially the *personnel* of the population of the place.

The history of the proceedings of these gentlemen is curious. It was only towards the end of 1864 that the success of the first experiments with the Japanese seed in Europe became known here. But, for many months, the interference of the Japanese Government with the course of trade prevented contracts being made for the precious grain, and, though something was done in a contraband way, it was of no considerable extent. At last the energetic and firm interference of H. E. Monsr. LEON ROCHES forced the Japanese Government to conform in some degree to Art. XIV of the Treaty and withdraw the restriction on the trade in Silk Worms' Eggs. Unfortunately the change came too late. The supply commenced only to meet the demand in the end of September, and great was the astonishment of the Japanese at the selections from their stock made by their customers. For the proper understanding of this part of our subject, it is necessary to state what everybody knows that, without going into subtler distinctions, Japanese silk worms' eggs are divided into two broad denominations—white and green. But we will go deeper into the subject. The Green are produced in the northern provinces, in a climate very like that of the silk growing country of Europe, and, in consequence of its rigour during a greater part of the year are an annual crop—or technically, univoltine. The White eggs come from the central districts where the climate is milder and can be produced twice or thrice a year at the pleasure of the grower. They are the bivoltine, trivoltine or generally, the polyvoltine varieties—each of less value as the reproduction is forced.

The green eggs produce only the inferior grades of silk and the white the best—the univoltine white producing the finest hank silk, which rivals, not unworthily, the best Italian. Unfortunately, it happened that, in the samples sent home in previous years, almost all the white were polyvoltine—the annual seed of that colour being retained by the Japanese silk farmers for their own consumption,—and these inferior whites naturally enough failed in Europe, while the Green eggs, all annual, matured with great success. Hence arose an unfounded prejudice against white eggs generally.

But the Japanese, in anticipation of a very large demand—an anticipation owing chiefly to the wise foresight and good counsel of the French Minister, (who had put himself, a year before, in communication with the Society of Acclimatization in France)—had prepared immense quantities of white seed, including a very large proportion of univoltine, on which they placed a high price. When the market opened, it was found that the foreigners would have nothing but green eggs! Considering that about four-fifths of the existing stock consisted of white the dilemma was an unpleasant one, and the result loss to both sides. The Japanese, we firmly believe, stinted themselves in their supply of the good white seed, tempted by the enormous demand which they anticipated, and this year's crop of silk is short. In addition, they have lost on the large quantities of white eggs which they raised at great expense, more than they have gained by the enhanced price of the smaller quantity of the green variety; while the foreigner has bought inferior produce at too high a price. Fortunately for the silk looms of Europe, some few thoughtful men there were, who went more deeply into the subject than their fellows—adopted the ideas which we have here developed, and shipped large quantities of eggs from those rejected by the many—and, having an immense quantity to choose from—have sent only the very best—and, a fair reward for their discrimination, at an excessively low price. A very conclusive proof of the soundness of our reasoning is to be found in the fact that at the end of the season, some of the chief Japanese merchants, finding that foreigners would not buy white eggs in spite of all that they could advance to dissipate the prejudice against them, shipped them themselves through such foreign houses as they could induce to take a share in their ventures, guaranteeing that the eggs were all annual and of the best quality, and, in some cases, consenting to give up all claim to any return whatever, should polyvoltine races be produced. Such is the interesting history of the great silk worm egg excitement of 1865. We anxiously wait the news of the out-turn of the merchandize shipped during the past 3 months of the year to verify the theories which we have here confidently advanced."

Trial of Australian Cereals in the Mirzapore District.

Extracts of letters from Mr. R. J. Carbery on the above subject were read.

In his first letter of 19th February, Mr. Carbery writes as follows :—

"In the autumn, I wrote you, I would sow some Pedigree Wheat, and give you a report as to the result. I had prepared land and had sown seed for transplanting, but on the 18th of October I had a fall from my horse that laid me up for five weeks, and compelled me to leave my factory, till the end of November. When I returned, it was too late to give the experiment full justice; I did try it in a small scale, and it has partially succeeded, so I must live in hope for another year.

You sent me four kinds of Wheat, White Tuscan, Warby's purple Straw, Talavera, Hallet's Pedigree.

The white Tuscan was a fine, large, full-grown soft wheat, the other two were similar but not such large grains; but unfortunately all three were completely riddled with weevils. I sowed at once in the early part of October the entire 10 seers of white Tuscan, but unfortunately not *one single* seed germinated. The other two kinds I sowed over and over again and succeeded in raising 9 plants of one, 36 of the other, these I planted out one foot asunder every way in my garden, and they are now magnificent plants just coming into ear. The Hallet's Pedigree Wheat I did not like as I have Country Wheat of my own growth of a finer quality. I have only 3 plants of it, but they are prodigies. The finest ears of these 3 plants,—9 and 36,—I will keep carefully by for sowing next winter. I have likewise about a ¼ of a Bigga of country Wheat plants that I transplanted Pedigree fashion in the early part of December, but I was too late and they are nothing extraordinary. The time in these parts for sowing Wheat or Barley for transplanting is, from 10th to 15th October, and the time for transplanting 30 to 35 days after. In England the single seed is sown one foot apart; I tried this one year, and lost all my seed; the white ants made short work of it. My plan is to sow thickly in a small space, and plant out one foot apart. I have had 128 full ears of barley from one plant—the produce of *one* grain sown."

In his second letter of 14th March, Mr. Carbery observes :—

"This season I am sadly unfortunate, all my Wheat has been attacked by the "Gerroowee." Rust, I fancy, is the English name for this fearful blight. All my land was well ploughed and thoroughly manured; my Wheat and Barley were the envy of all the natives around me; but a succession of easterly winds brought on this destructive blight that has at once ruined the crop. The ears are large and fine but the grains in the ear are all shrivelled up, as if plucked before being ripe;—and so shrivelled up in drying, I cannot even get seed from my own Wheat for next year's sowing. The Rust, if such is its name, has attacked the 36 plants and 9 plants saved from the Australian Wheat you sent me in October; these I had sown Pedigree fashion, the plants gave out numerous stalks and fine large ears, which are not yet ripe, but I fear the grain will be shrivelled and useless for seed. All the leaves and stalks of my Wheat looked as if dusted with ground "Hulldee," and the very ground was covered with the yellow blight. I, strange to say, have fared much worse than my native neighbours. It has not attacked my Barley to so great an extent as my Wheat. I have about 4 biggas—the large Indigo bigga—of Wheat, and cannot get 1 maund of fine full grain to put by for seed. Do you know if the question has ever been mooted as to whether there is any preventative to this destructive blight to Wheat.

"I sowed some Oats on the alluvial land at the banks of the Ganges. This morning I went to see if the fields were fit to cut and to collect some of the finest ears or heads to put by for sowing next year. To my surprise my people brought me some plants with perfectly black grains to them. These plants are precisely the same as all the others, except the outer skin or covering of the grain itself, which is black. I enclose a specimen.* I never saw it myself before this."

Mr. W. Stalkartt mentioned that his experience, on a limited scale, with Australian Oat seed, for four years, was to the following effect,—that the plants grew readily, and very strong, and attained a greater height than Country Oats, but that it did not seed nearly so well as the latter, and required longer time to attain maturity. It would answer very well as a green crop, but not for production of seed.

COTTON CLEANING MACHINERY.

Read a letter from Mr. A. W. Roghé, reporting on a trial given to Carver & Co.'s Saw Gin, and Platt Brothers' Roller Gin:—

"A few days ago I worked your Saw Ginning Machine, made by Messrs. Carver and Co., by steam, with a speed of about 300 revolutions per minute. The out-turn was 36 pounds of clean Cotton per hour, and I think that with proper arrangements the quantity might be increased to 40 pounds. The Cotton came out beautifully clean, without any seed mixed with it, nor do I think that the staple is shorter than if worked by Platt Brothers' Machines, but at first sight it appears so, because the Roller Gins do not separate the fibres as much as the Saw Gins. Comparing the merits of the Saw and Roller Gins, I am hardly able to give an opinion, because the Roller Gin, now in your possession, is inferior to those which are in use on the Bombay side. For Bengal Cotton, I think the Saw Gin is preferable, provided it can be purchased at the same price as the Roller Gins, which can be got at about Rs. 200. The latter are said to produce 35 maunds of clean Cotton on the Bombay side, but I doubt very much that this would be the case with the Bengal Cotton.

To be able to give a fair opinion on the subject it would be necessary to have the two machines side by side, both working with the proper speed, &c.'

Some little discussion ensued after the reading of Mr. Roghè's letter, in the course of which Mr. Bayes remarked that, though his experience in cotton ginning was limited, he would wish to make a few observations. His first essay at ginning was at the Alipore Exhibition in January 1864, with two of Platt Brothers' Macarthy Gins, one a 40-inch single action, and the other a 12-inch double action Gin. He found both these Gins to work well as regards cleaning the cotton, but he preferred the single action Gin, especially when run by power; but the yield is but small, and the Gin requires great care in feeding. He had no opportunity of thoroughly testing these Gins, but he did not think the 40-inch Gin turned out more than 30lbs. of clean cotton per hour. His next attempt was with one of Emery's Patent Saw Gins, with 13 saws, with cleaner and condenser, and worked by two cranks; this Gin is very effective and will turn out from 40 to 50lbs. of clean cotton per hour; delivering it in one continuous flake. He next tried some American "Eagle Cotton Gins," with 18 saws. These he worked by steam power. They delivered the cotton from a rotary brush actuated from a fan. The cotton comes out very clean, but some means are required to secure the cotton as it leaves the machine, otherwise it falls all over the room. The yield of these Gins is fully equal to the Emery. His next attempt was with a 24-inch Wanklyn's Patent, but he found considerable trouble with it, having had very inferior cotton to use, and he is consequently unable from experience to state the capability of the machine. Mr. Bayes further observed that his last and most satisfactory trial was with a Roller Gin of Evan Leigh's 20-inch Patent improved Macarthy Gin. In this Gin the reciprocating knife works horizontally, so that you feed on the top of the machine; and from the short time he had to adjust and work the Gin (about an hour and a half) he was very much pleased with it. It feeds much easier than any other Roller Gin he has tried, and seems to grip the Cotton much more rapidly and evenly than with the vertical reciprocating knife. Mr. Bayes added that, with reference to the relative merits of the Saw Gins and Roller Gins, the Saw Gins must bear the palm, as to the quantity of clean cotton produced; and in some cases he is of opinion that they more thoroughly clean the seeds. He thought, however, that, as a rule, the Roller Gin cleans the seed the best. In one instance he was aware of saw ginned cotton having been afterwards put through a Macarthy Gin. Mr. Bayes stated in conclusion, that, so far as his experience with short staple cotton went, he was inclined to favor the Roller Gins as producing a better quality of cotton and more thoroughly cleaning the seed; but against this must be placed the comparatively short yield. The cotton he had seen cleaned by the Eagle Gin did not appear much damaged, but the Native Merchants on comparing it with that cleaned by the Macarthy, pronounced in favor of the latter.

The Secretary remarked in reference to the above, that to the Eagle cotton Saw Gin was awarded a prize of Rs. 2,500 by the Government of India, through this Society, in 1853. The cotton cleaned by this machine was pronounced at the time to be very slightly injured. He had also seen the Emery Cotton Gin working at the great Exhibition of 1862, on Surat cotton; it operated very speedily, and with apparently, very little, if any, injury to the staple.

COMMUNICATIONS ON VARIOUS SUBJECTS.

The following letters were also submitted:—

1. From Dr. David Scott, Umballa, dated 12th March, forwarding some remarks on Mr. Macnight's and Dr. Madden's papers on the practice of in-breeding,

as developed in the Pamphlet published by the Council of the Acclimatization Society of Victoria. (Transferred to the Committee of Papers.)

2. From Dr. N. Chevers, Officiating Inspector-General of Jails, enquiring what are the best permanent red and blue dyes for country yarn.—"It has been determined to manufacture prison clothing in the Jails, and to distinguish them by red and blue checks and stripes, but some difficulty has been felt in coloring the yarn permanently, so that by washing the colours may not fade or turn dull."

The Secretary mentioned that the required information had been given.

3. From J. C. Wilson, Esq., C. B., New Zealand, promising, in reply to a requisition to that effect, to send a good quantity of the best kinds of New Zealand Potato tubers.

4. From Dr. G. Henderson, Secretary, Agricultural and Horticultural Society of the Punjab, requesting that a number of cuttings and plants of Olives, Vines, Mulberries, &c., which he is expecting from Italy and England, *viâ* Calcutta, may be received and taken care of in the Society's Garden till next cold season. Agreed to.

5. From Messrs. James Carter and Co., advising despatch of a collection of ornamental bulbs and tubers. These have just been received, and it was agreed that they be forthwith disposed of at prime cost.

6. From Messrs. Law, Somner and Co. of Melbourne, acknowledging receipt of order for field seeds, and promising it their best attention.

For the above communications and presentations the best thanks of the Society were accorded.

(*Wednesday, the* 18*th April* 1866.)

W. STALKARTT, ESQ., *Vice President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

Mr. R. F. Stevens was elected a Member.

The names of the following Gentlemen were submitted as candidates for election:—

Lieutenant Lachlan Jamieson, 7th Hussars, Sealkote,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Captain W. E. Delves Broughton, 37th N, I., Tezpore,—proposed by Mr. S. Jennings, seconded by Mr. W. Stalkartt.

T. H. Lawrie, Esq., Seebsaugor, Assam,—proposed by Mr. Alexr. Lawrie, seconded by the Secretary.

J. S. Bowman, Esq., Manager, Hope Town and Balasun Tea Companies, Darjeeling,—proposed by Mr. R. Blechynden, seconded by the Secretary.

The following contributions were announced:—

1. Memoirs of the Geological Survey of India, *Palæontologia Indica*, 3-10-13,—from Dr. Oldham.

2. Report of the Bombay Chamber of Commerce for 1864-65,—from the Chamber.

3. Selections from the Records of the Government of India, Foreign Department, No. 49,—from the Government of Bengal.

4. Tea Planting at Darjeeling, will it pay? second edition, enlarged,—from the Author.

5. Prize list and report of the second Exhibition of the Agra Divisional Agricultural Association,—from the Association.

6. A collection of Orchids from the Andamans,—from Mr. J. N. Homfray.

7. Three plants of *Cœlogyne* (new kind) and some seeds of *Victoria regia*,—from Dr. Anderson, Superintendent of the Royal Botanic Garden.

8. A collection of Orchids from Assam,—from Mr. Samuel Jennings.

Mr. Jennings also submitted for inspection some fine grown plants, in full flower, of *Dendrobium transparens*, *D. densiflorum* and *D. Devonianum*.

9. Two samples of Cotton raised in his Garden,—from Mr. Jennings.

This Cotton is the produce of certain seeds received from Dr. Bonavia of Lucknow, in June last, to whom they were sent from England by Major Trevor Clarke, *viz:*—

No. 1—The produce of a cross between Egyptian Sea Island and New Orleans.

No. 2—The produce of a cross between Egyptian Sea Island, and Sea Island.

Mr. Jennings read a report, dated 19th March, which he had received from London, on sample No. 2, describing it as "clean, bright, and very superior quality, free from leaf and discoloration: value three shillings per pound."

A report was read from a section of the Committee, (Messrs. Mosley and Agabeg,) on the two samples of Cotton raised in the Jail Garden at Hazareebaugh, and presented by Dr. Banbury at the last Meeting.

The sample raised from acclimatized New Orleans seed is described as "a nice silky Cotton of good color and staple, irregular in length and strength of fibre, in which respect there is evidence of deterioration from original stock." The second sample, evidently the produce of indigenous seed, as "short in staple, fibre very strong, and color good; the quantity, however, is too small to admit of a fair report."

COMMUNICATIONS ON VARIOUS SUBJECTS.

Letters were read:—

1. From Under-Secretary Government of Bengal, dated 23rd March, submitting an account of the Agricultural Exhibition held at Debrooghur on the 1st of February last.

2. From Dr. David Scott, Umballa, forwarding a paper entitled "Agriculture in India, with reference to food for Europeans." (Transferred for publication in the Journal.)

3. From the Secretary, Asiatic Society, acknowledging receipt of certain specimens of wood (alluded to in last Month's Proceedings,) obtained in digging a well at Ballygunge. Mr. Blandford remarks, that these specimens appear to be identical with some which he obtained from a tank at Sealdah a few years ago, at a depth of 20 to 30 feet, and which Dr. Anderson considered to be of Soondree wood. Mr. Blandford's observations are published in the Journal of the Asiatic Society for 1864.

4. From the Superintendent of the Geological Survey of India, acknowledging receipt of specimens of the wood alluded to above.

5. From S. Jennings, Esq., submitting two samples of "new Vegetable Green Dyes, which have been recently discovered near Assam."

It was agreed that Mr. Waldie be requested to offer his opinion on these Dyes.

6. From C. S. Turnbull, Esq., forwarding a skein of raw Silk, reeled from the Cocoons (Japanese stock) which were submitted at the last Meeting. Mr. Turnbull reports the Cocoons to be "very good, reeled remarkably well, and free from foul threads."

7. From Lieut.-Col. D. Gaussen, Dehra, acknowledging receipt of some eggs, the produce of the above-mentioned stock. Colonel Gaussen mentions that he has forwarded them to Captain Murray, who is now at his Mulberry Plantation at Rooderpore, and has requested him to furnish the result of his experiment for the information of the Society.

8. From H. F. Blandford, Esq., Secretary, Asiatic Society, forwarding a packet of "Tea leaves," received from Captain Lloyd, Deputy Commissioner, Tonghoo, British Burmah, who found the plants in a Valley east of, and 30 miles from Tonghoo. These leaves are recognized by Dr. Anderson as belonging to *Eurya Chinensis*, the Ternstrœmiaceous tree which is usually mistaken for Tea.

9. From James Cowell, Esq., London, dated 18th February, in reply to a reference on the subject of the *Ervum Ervilea*, as suggested by Colonel Dalton (see Proceedings for November last). Mr. Cowell writes "I at once, (on receipt of your letter) wrote to my friend in Algeria and conveyed to him yours and Colonel Dalton's remarks in respect to the Vetch, said to have been imported into France, as fodder for Cattle from Africa. I have lately received a reply, from which you will observe that the Vetch referred to, is pronounced by the French Veterinary Doctors as unfit food for Cattle, indeed, poisonous, as you remarked. M. Hardy, the Director of the Imperial Garden at Algiers, states that all the virtues attributed to this Vetch by the Arabs have no foundation, and I therefore have not troubled my friend further about it."

10. **From Major J. G. Hathorn, Darjeeling, dated 13th April, in reference to the packing of Tea seed.** "I beg to return my best thanks," writes Major Hathorn, "for the Cachar Tea seed just arrived. It is much decayed. I think Tea seed is best transmitted in coarse bags, enclosed in basket work or such like material, so as to allow of a free circulation of air. I am putting down Darjeeling seed, now about 6 months off the trees, which has been kept in coarse bags for a long time, and is as fresh as possible. This seed from Cachar was, perhaps by an oversight, sent to me in a box, and I have always noticed that Tea seed so enclosed, rots rapidly. Charcoal does not seem to save it at all. This was mixed with charcoal."

The Secretary mentioned that the seed alluded to by Major Hathorn was about 6 months old when it reached him, and probably to this, more than the mode of packing by his agent, the failure may be attributed. In reference to Major Hathorn's recommendation for coarse bag-packing, he drew attention to the following memorandum of Mr. Haworth, which was submitted at the Monthly Meeting of September 1862:—

"The seed, when quite ripe, should be taken from the capsules as soon after it is removed from the trees as convenient, and it should then be dried in the sun for an hour or two; strong iron-clamped tea boxes are the best package, and the seed should be put in along with dry pounded or coarse dust wood-charcoal, as follows,—a layer of charcoal of about half-an-inch in thickness to be spread over the bottom of the box, then a layer of seed laid close together, and another layer of charcoal, just enough to hide the seed, and so on until the box is quite full; care being taken to press down the mass with the hands on the completion of every third or fourth layer, and at the same time spread over the surface a sheet of old newspaper, or country paper, thin matting, or old wrapper, and repeat this at every third or fourth inch in height; the paper to be cut somewhat larger than the box; the object of this is to prevent the seed from working up, and the charcoal from descending by constant shaking in transit, and which will be the case if some precaution of this kind is not adopted.

"Ripe Tea seed, Cotton seed, and many other kinds of seed so packed, will remain in good condition, and vegetate well after a long lapse of time, and they are not affected by great changes of temperature, or by the packages getting wet when so treated. The boxes should be lashed with strong rope as it prevents their being piled too close together, and provides for a circulation of air amongst them."

Mr. Haworth, in his note accompanying the above, remarks that all the seed he has packed as above recommended, has succeeded well; whilst that packed at the same time in bags only, he has never found to give more than 20 to 30 per cent of plants.

11. From Dr. Geo. Henderson, Secretary, Agricultural and Horticultural Society, Lahore, dated 26th March, regarding the satisfactory result of a consignment of Fruit trees from England. "This year I got a box of Fruit trees from

Messrs. Waterer and Co. of Bagshot; they arrived here about the beginning of February and were in perfect order, not a single plant was sickly, and some bundles of Vine cuttings which came in the box, were cut into short pieces, containing a single eye each, and planted; almost all these have commeneed to grow.

"Messrs. Waterer and Co. have a new way of packing Fruit trees for export, and, I believe, the trees scarcely ever suffer from the long journey. If any of your correspondents happen to want trees from England, you should recommend them to Messrs. Waterer and Co."

For the above communications and presentations the best thanks of the Society were accorded.

(*Wednesday, the 16th May 1866.*)

A. Grote, Esq., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The following Gentlemen were elected Members:—

Lieutenant Lachlan Jamieson, Captain W. E. D. Broughton, Messrs. T. H. Lawrie, and J. S. Bowman.

The names of the following Gentlemen were submitted as candidates for election:—

C. H. Lane, Esq., Manager, Nabor Habi Tea Company, Seebsaugor, Assam,—proposed by Mr. T. E. Carter, seconded by Mr. S. Jennings.

Richard Tregear, Esq., Kolingera, Juanpore,—proposed by Mr. H. H. Fell, seconded by Mr. E. T. Atkinson.

George Butt, Esq., C. S., Moradabad,—proposed by the Secretary, seconded by Mr. Grote.

Weston Parry, Esq., Kamahatty,—proposed by Mr. E. V. Westmacott, seconded by the Secretary.

Adolphus Wallace, Esq., Rungajaun Factory, Golaghaut, Assam,—proposed by Mr. S. Jennings, seconded by Mr. S. H. Robinson.

Major W. Macdonald, 12th Regiment N. I., Ranchee,—proposed by Col. E T. Dalton, seconded by Mr. Grote.

J. F. Cockburn, Esq., Kanoo Junction, Burdwan,—proposed by Mr. W. Stalkartt, seconded by Mr. Robinson.

Haines Wickes, Esq., Ex. Engineer, Chittagong Division,—proposed by Lieut. T. H. Lewin, seconded by Mr. Grote.

Fred. Thos. Rice, Esq., Noorpore Factory, Khamrah,—proposed by Mr. H. Maseyk, seconded by Mr. A. N. Stewart.

The following presentations were announced:—

1. Tea cultivation in the District of Darjeeling: being a few observations on deep cultivation and surface draining,—by the Author.

2. Selections from the Records of the Government of Bengal, No. 42,—by the Government.

3. A Lithographed Portrait of Sir Jamsetjee Jejeebhoy,—by Mr. J. A. Crawford.

4. A collection of Orchids from Assam and Sylhet,—by Mr. S. Jennings.

5. A packet of Bamboo seed, from the Malda District,—by Mr. J. J. Gray.

6. A sample of Arrowroot grown and manufactured at Chandernagore,—by Mr. J. H. Galopin.

7. Two skeins of Japanese raw Silk,—by Mr. T. H. Mosley, on behalf of Mr. R. B. Parr of Hong-Kong.

8. An entire Fleece shorn from a China Ewe,—by Mr. J. A. Crawford.

(Further particulars regarding this Fleece will be found in the body of the Proceedings.)

The following recommendation from the Council was submitted, and unanimously agreed to:—

"The Council having used their best endeavours to find a new site for the Garden occupied by the Society in an eligible position, and having up to the present time been unsuccessful in their endeavours, and in consideration of the large amount of the Society's means already sunk in the cultivation of the ground adjoining the Botanical Gardens, they recommend that a further representation be made to Government to allow the Society to continue in possession of the ground at present occupied by it."

The Council also recommended, on behalf of the Finance Committee, that the sum of Rs. 5,066 be carried to the irrecoverable list. This amount is made up partly of arrears of subscription, of which the recovery is hopeless, partly of subscription debited to Members after they had left the Country, and which, consequently, they are not called on to pay, and partly for subscriptions due by others whose residence cannot be traced.—Agreed to.

TEA CULTIVATION IN INDIA.

Read the following letter from Dr. R. Whittall, Resident Manager of the Dehra Doon Tea Company, in reference to a communication from Major Hathorn which was submitted at the Monthly General Meeting in March last:—

"My attention has been called to a paper on "Tea Cultivation in the Himalayan Range," read at the Society's last Monthly Meeting and published in the Journals of the following days. As Dehra Doon is quoted in the paper to which I refer, in a manner that may cause anxiety to many interested in Dehra Doon Tea Plantations, I wish to correct some mis-statements in Major Hathorne's paper.

Tea planting on the single plant system does not prevail in the Dehra Doon; the prevailing practice is, and to judge by the appearance of bushes on all the older Tea Estates, always has been to plant together from five to a dozen plants to form the bush, and generally in rows five feet apart each way; when this plan has been departed from, it has usually been by reducing the intervening spaces to 4½ feet

×4½ feet or sometimes to 4 feet × 4 feet never I think extending it beyond 5 feet × 5 feet which will give at the lowest 1,742 bushes to the acre.

Major Hathorne's paper gives the yield per acre at Kaolaghir for last season, (1865, I presume,) as 66 lbs. This may be true as the average over the whole Plantation, but I know that from those parts of the Plantation which have been cultivated with a view to the production of Tea (not of seed and seedlings for gratuitous distribution to the Public,) yielded a far higher average; some parts, I think, as high as 1,000 lbs, but on this point, I am quite sure, Dr. Jamieson or Mr. James Thompson would have, if applied to, given full information. On this, (the Dehra Doon Tea Company's Estate), the average yield for the area from which leaf was gathered, including plants put out in 1861, was 172 lbs. per acre, while from some of the older portions 822 lbs. was obtained.

The question of the advantages or disadvantages of a single-plant bush is an open one, it has its "advantages," in that it can be hoed and manured so well up to its roots, and it can easily be kept free from those weeds and grasses so destructive to the leaf-producing powers of the bush, which, though they can be kept under, are ineradicable. It is impossible to keep a bush of many plants free from these, and it has not been proved that a single-plant bush will become more woody,—I should expect the very opposite effect."

Read also a letter from Messrs. W. C. Stewart and Co., enclosing the following remarks from a Gentleman who has had a great deal of experience in Tea Planting:—

"Some time ago I forwarded to you under envelope a piece of root from two Tea plants, which roots, as you will have seen, were perforated absolutely through by the root of the Soon or Oolie grass.

This species of jungle, where the soil is rich, grows to the height of from six to ten feet. The roots of this grass have points as sharp as needles, and extend two to five and six feet horizontally, producing numerous off-shoots as they extend in this way. And in consequence of its prolific properties, the surface of the earth, in localities where it is abundant, to a depth of from 6 to 15 inches, is absolutely matted. Since I forwarded those specimens to you, I have met with several instances of a similar kind, where the roots of the grass had penetrated through the roots of the Tea plants, and projected shoots on the opposite side. Should it be asked if I dig about the plants for the purpose of searching for such instances, I of course say no; but it is in my painfully troublesome endeavour to eradicate the jungle from amongst the Tea plants that I have found them.

I herewith enclose a receipt for a box to your address, containing three or four plants with the jungle roots connected, as I took them out of the ground, by which, with the specimens previously forwarded to you, you will readily conceive the blastings effects of such jungle not having been eradicated before the seed or plants were put in the earth, or, having been partially eradicated, allowed, through negligence, to propagate itself again. You will also, by an examination of the way the roots of these plants are interlaced, and bound up by the roots of the jungle in question, be able to judge of the exceeding delicacy of the operation I have had in hand (clearing and cleaning the soil) with operators such as we have here. With all the care and attention I could possibly exercise, I found it utterly impossible to clear the roots of the plants effectually without more or less prejudice to the plant for the time being. But in the first month of the rains the plants will fully recover themselves from the injury thus caused, and in one season they will recover themselves from the effects of being hitherto bound up by the jungle. On many plantations there is no attempt made to clear the soil of the jungle, the surface is merely hoed over to keep the jungle down, which operation rather tends to thicken and strengthen the roots, which is the great cause of many (numerous) plantations yielding in no proportion to the reasonable expectations of parties concerned; for I hesitate not in asserting that the yield of one acre, kept in proper cultivation, will be equal (if not more than equal) to the produce of four acres cultivated in the way above referred to.

As many I know feel themselves disappointed in Tea, I wish you, please, to exhibit the state of these plants, and the roots before forwarded, to your mercantile friends who are connected with, or interested in, Tea cultivation, after which, please have the goodness to forward them to Mr. Blechynden, at the Metcalfe Hall, who will be glad to see such specimens, and take a pleasure in exhibiting them to all who come and see, as the great cause of the non-productiveness of numerous Tea Plantations, and which will, perhaps, awaken them to a sense of the necessity of having Superintendents who have a knowledge of Agriculture to guide them in their operations. If a man is a practical agriculturist it matters not if he has never seen a Tea plant. He will know at once how to deal with it, to secure the greatest amount of produce. But, as with other arts and professions, so with agriculture. It is, in my opinion, impossible for a person to acquire a thorough knowledge of any art or profession, and a capability of communicating that knowledge to others, without, or unless he himself has had personal practice in the matter.

I shall only add that as my sole object in forwarding these specimens to you is to convince those, or at least some of those, who have been disappointed in their expections from Tea cultivation, of the great cause of its imaginary failure, and that the basis of that cause has been ignorance or negligence, or both combined of the Managers, I know you will readily aid me in the furtherance of that object.

Speculators who have been brooding over the painful thoughts of having lost all, will again look forward to a realization of their once fondly cherished hopes, and Tea cultivation will at last receive the attention of, and impetus from capitalists here and at Home, which it has always wanted, but never yet had."

The specimens in illustration of the above remarks were placed on the table, and can be seen by any persons interested in the subject.

Submitted a note from Mr. H. H. Brownlow, Manager, India Tea Company of Cachar, in reply to the Society's Circular, requesting information as to the average yield of Tea per acre in the principal Tea Districts, from plants of different ages.

It was agreed to retain this and all other replies, for a certain time, and then submit them in a tabular form.

REPORT ON JAPAN EGGS, COCOONS AND SILK.

Read the following report by Mr. C. S. Turnbull, Manager, Radnagore Silk Filatures, (furnished by Messrs. Jardine, Skinner & Co.), on Japanese silk eggs :—

"The Japan eggs which you made over to me I did not open for some days, owing to the rain, and unsettled state of the weather. In doing so, I found some had hatched and were alive, the rest looked healthy. I lost no time in distributing them to every filature for the purpose of being made over to the rearers of their respective filatures.

Color of eggs.—White, green and brown.

Those that hatched.—Do. do. do.,—on an average 40 to 50 per cent.

Species.—From the eggs, I should say, two kinds. In the difference of cocoons, three.

Quality of Cocoons.—Small in size, about our China, *very hard*, shape different; showing a dent round about the centre. From the appearance of the cocoons, I came to the conclusion that the produce in silk would be greater, and chussum less than Bengal cocoons.

In testing them I found 2 chittacks in weight gave 400 Japan, and 480 China, both being dried.

Produce of Cocoons.—1,680 cocoons yielded 1 chittack 2¼ tolahs of silk, being 31¼ per cent, 25 per cent, 18¾ per cent, 12½ per cent and 6¼ per cent respectively, more than ours, at seers 2, 2-2, 2-4, 2-6, and 2-8 produce of silk per maund of cocoons. It is almost needless to add that 2 seers 8 chittacks is seldom or ever attained from China, Madrassee or chotâ cocoons.

Quality of Silk.—I consider it *infinitely* superior to the general run of Radnagore silk, and not far short of Italian; it is more mellow, has greater gloss, no foul threads, and no nibbiness compared with ours."

PROLIFIC OATS.

Submitted the following notes from Mr. C. Horne, showing the yield in the second year from one grain of Oats :—

Benares, March 28*th*, 1865.

"This morning I noted a self-sown plant of acclimatised English white Oat. There were 50 or 60 plants around, all very luxuriant, as they grew in good soil, and got plenty of water, being in the small bund between vegetable plants.

Height of plant	3 ft. 6 in.ft. 6 in.
Number of stalks	35.
Number of good grains	4,180.
Weight of the same, about	4½ oz.

Mynpoory, March 28th, 1866.

Sowed of the above grains about 9 inches apart, 3,928—gave 3 waterings. The soil somewhat poor. Average height of crop from 3½ to 4½ feet. Counted the produce of one plant of 17 stalks = 1,741 grains.

Weight of produce	79¾ lbs.
Weight of straw	100 lbs.

Being the produce of one grain of Oats in the second year."

CHINA SHEEP.

Read the following letter from Mr. John Powell, Rosa, *vià* Shajehanpore, in respect to the Ong-Ti breed of Sheep:—

"In the last No. of the Society's Journal, I have read the letter of Mr. King, referring to the Northern China breed of Sheep, called Ong-Ti, which grows to a large size.

It seems to me that this stock is much what is required for Upper India.

In Oudh and Rohilkund, the native breed fattens quickly, but the wool is coarse, and the carcasses when fat do not exceed 35lbs. in weight, the grass-fed supplied to the Troops being only from 20lbs. to 25lbs. in weight.

In consequence of the lightness in the carcass, no Zemindar thinks of breeding; but if the weight could be increased to 100lbs, it would be worth his while to do so.

At present the breeders are itenerant shepherds, who roam about the country. They never fatten the sheep, and the consequence is that all consumers of Mutton have to attach themselves to Station Clubs, or to depend on the butchers, whose meat generally is neither agreeable to the sense of smell or taste, from the sheep being fed and fattened on gross food.

Two years since one of the batch of Merino Rams was sent to me, and from him I have now a lot of half breds; these are a great improvement in respect to the wool, but the size is small: with an Ong-Ti Ram to cross with these half breds, I think a description of animal would be introduced which would be profitable to keep.

I will willingly incur some expense to obtain such a Ram, and if the Government will send me one free of cost, I would engage to supply the mixed breed with my own stock free of expense to applicants in this District.

It is a subject which, I think, should be brought by the Society to the notice of Government, as the introduction of the larger breed would be a gain to Government and a public benefit."

It was agreed that a communication be made to Her Majesty's Minister at Pekin, to aid the Society in obtaining a couple of Ong-Ti Rams. Mr. Crawford kindly offered to place at Mr. Powell's disposal a ram lamb from his China stock, which offer was thankfully accepted.

Mr. Crawford also submitted a memorandum regarding the fleece already referred to. (See body of the Journal.)

Flora of the Country between Umritsur and Tret, and towards Murree.

The following notes from Mr. H. Cope on the above subject, were next submitted:—

"We are so far on our way to Murree, (within 10 miles of that place,) in the midst of hills, at an elevation of 3,200 feet, and already feel a material change in the temperature. The weather is delightful. I have no thermometer, but imagine 52 to 55 to be the figure in the morning. Generally speaking the Hills,—especially the higher ones, forming the boundary of the Hazara and Rawul Pindee districts—are very bare, but the lower ones are covered with a profusion but not a variety, of shrubs with some trees, nowhere constituting a forest. The *Pinus longifolia* (cheer) is the predominant tree. There are a few stunted Silk Cotton trees *(Samalia Malabarica.)* Some Kukkur trees *(Rhus acuminata)* and the Kao (wild Olive trees). Also a handsome *Bauhinia,* now in full flower. Amongst the shrubs stands out prominent in number and appearance (the Hill side, occasionally white with it) the enchanting submontane *Justicia adhatoda*; then the hill *Carissa,* a beautifully green shrub not yet in flower, and the Bog Myrtle, *(Dodonæa)* of which the trim hedges of the Rawul Pindee gardens entirely consist. In some places it forms the great mass of the vegetation. I have also noticed a shrubby *Polygala,* a very pretty *Buddlea,* some fig trees, a beautifully bright yellow *Cæsalpinia, Ber* shrubs and one or two other hill and plain shrubs, so mixed up that it would be difficult to say which predominate most.

Amongst the more prominent plants, especially shrubs, now in flower or seed, I may add the Kameela (*Rottlera tinctoria*) the *Cordia* that is seen far down in the plains, a bright *Clerodendron,* and an exceedingly pretty *Astragalus.*

The beautiful foliage of the wild Pomegranate, stands out conspicuous from its neighbours, while the wild pear and the *Vitex Negundo* again testify to the mixed character of the vegetation. The elegant *Eranthemun pulchellum,* rivalling the blue canopy above in the brilliancy of its color, peep from below the Willows *(Salix tetrasperma,)* along the banks of the perennial stream that supplies water to the village and its lands, and, altogether, there is much to interest in the neighbourhood.

The Camels, (used largely as beasts of burden even up here) feed at large in the hill jungle, but find it difficult to secure a sufficiency, even among the thickest thickets. They have the *Acacia modesta* (Phoolaee) which, at the very best is scarce; the *Carissa* is too thorny even for their rough tongues, and the *Justicia* too bitter. Between the three they manage, however, to subsist.

Beyond Tret towards Murree, the vegetation becomes more Alpine; the *Carissa* disappears and makes room for the pretty flowering Rusout (*Berberis aristata;*) an elegant Honeysuckle is abundant; the *Pinus longifolia* assumes larger dimensions (some trees seemed at least seven feet in girth, tall, straight, and elegantly pyramidical); the Oak shews in considerable numbers; a handsome *Salix* fringes the many abundant Water Courses, while several other shrubs show in occasional patches. The approach to the foot of Murree from the Goragullee gap, where the eastern range joins the Hazara boundary chain, is picturesque, and the ascent from the Brewenj, well wooded with Firs, white Poplars, Pear trees and Oak. High up might be seen, in retired nooks, a few scarlet Rhododendrons, but not a single white one did I notice. Murree is disappointing, but must have its redeeming points or so many houses would not have been built here. The flower of the season is decidedly the humble but highly-scented Violet, that, in some spots, forms an exquisite carpet of blue and green, enlivened by the dazzling white of the Crocus.

As to temperature, you will understand its character when I tell you that on this, the 24th April, the glass is standing at 2 P. M. at 56° in the shade.

There are several Tea Plantations on a small scale along the road from Rawul Pindee to Murree at various elevations. One at Chuttur, another at Sealee, one at Tret, and a fourth higher up at Shamlee. Those at Chuttur and at Tret I have looked at, and I much fear that, notwithstanding all the care bestowed upon them, the Tea will not thrive on these Hills. The plants are very small for their age and not healthy looking, and I should say the fault is with the soil. This is much to be regretted; but it was an experiment, and it was quite as well to make it."

COMMUNICATIONS ON VARIOUS SUBJECTS.

The following letters were read :—

1. From J. J. Gray, Esq., in reference to the flowering of the Bamboo this year in the District of Malda :—

" If I recollect rightly, sometime since there was a correspondence regarding the flowering of the Bamboo. In this District at present there are whole tracts of country in which the Bamboo has flowered, and the grain is being sold in considerable quantities in the Bazaar. The ryots having stored enough for their own wants, are selling the surplus at the Sooltangunge Hât, near my house. Last Hât day it was selling at 13 seers per Rupee ; the price of rice being 10 seers.

This Bamboo harvest has been quite providential as, with present prices, the Ryots, in the part of the country where the plant had flowered, were on the point of starving. The wild Bamboo is principally found to the north of the Station of Malda, on the site of the ruined City of Peruah or Pundooah and in its neighbourhood ; I hear hundreds of maunds are being sold at Malda English Bazaar, and other Hâts in that neighbourhood. The very fact of large quantities coming to Sooltangunge, some 25 to 30 miles distant from thence (Peruah,) shows how plentiful the harvest must have been.

It is the cleaned grain that sells for 13 seers per Rupeee, and I have the pleasure of sending a small portion unhusked which I have pulled out of a maund of the clean grain.

I am told that the same occured about 40 years since.

If you can suggest any further enquiries, I shall be happy to obtain whatever further information may be required.

The Behoor Bansh, or *Bambusa spinosa* is very plentiful, I know, about Peruah and also Malda, it is consequently probable that it is this species which has flowered; but on this point I have no positive information."

In a subsequent letter, when sending down a quantity of seed, as requested, Mr. Gray observes:—"I expect shortly to be able to send some further information on the subject, at present all I can add to what I mentioned in my former letter is, that Mr. Ravenshaw (Magistrate of Malda) who has seen the Bamboo flowering, states that it is the *wild thorny* species alone which has flowered so extensively, confirming what I have already stated as to its being the *Bambusa spinosa*."

2. From the Secretary, Acclimatisation Society of Melbourne, announcing that the fourth attempt at introducing the Eggs of the *Eria* Silk moth had proved unsuccessful, and enclosing the following report by Professor McCoy:—

"Professor McCoy has the honor to report that, on opening the case of Castor-oil silk worms, he found that only one or two of the plants were alive. The success of the method of sending the insects suggested, namely, sending cocoons in Wardian cases with young plants, seemed again to have been successful as far as they were concerned. The moths had come out on the voyage—the female had been impregnated—the eggs deposited and hatched; but a hole having been made in the Wardian case, they probably escaped or were destroyed by other insects, and the plants for the most part died. The experiment must be again repeated, taking care that the case is kept secure; and it is suggested that a second case, with an additional supply of rather older young Castor-oil plants should also be sent, which the Captain or other friendly person in the vessel could supply to the boxes if required."

Resolved that the attempt be repeated by the first good opportunity offering.

3. From Dr. George Henderson, Secretary, Agricultural and Horticultural Society of the Punjab, dated April 3rd, requesting information in respect to the value of the timber of the various sorts of *Eucalypti*:—

"Can you get for me any book with a description of the timber of the Australian Gum trees? I find in Skinner's Indian and Burmese Timbers, that the *Eucalyptus piperita* yields a timber superior in many respects to Teak, but I can get no information regarding the others. The following information as to the growth of some Gum trees in the Punjab is most interesting; it was furnished me by Captain Horne of Madhapore, where a good many Gum trees are growing. Seeds were sown in end of 1861, and two trees are now 48 feet in height, and stem is 32 inches girth at ground; 35 feet in height, and stem is 24 inches girth at ground."

In reference to the above, the Secretary drew attention to an article in the *Gardener's Chronicle* for 1862, and to a lecture delivered by Sir Charles Nicholson to the Society of Arts in November 1863, in which some useful details are recorded. Agreed that these, and any additional information that can be obtained, be furnished to Dr. Henderson.

4. From the same in respect to the introduction of the Brazil Nut tree into the Punjab :—

"At our last Meeting his Honor the Lieut.-Governor suggested that I should take steps to introduce into the Punjab the tree which produces Brazil Nuts—*Bertholletia excelsa.* I shall feel much obliged if you or any of your correspondents can give me any suggestions as to how I can best secure either fresh seeds or young plants. Probably it might be got over by some vessel from Brazil to Calcutta. The seeds will probably spoil on the way, but if planted in a box, we might get the seedlings in safety."

The Secretary intimated that attempts to raise plants in the Society's Garden, from Nuts received from England, had entirely failed. It was agreed to introduce Dr. Henderson's requisition in the proceedings of this day's Meeting, in the hope of attracting notice, and, perhaps, some useful suggestions on the subject.

(*Wednesday, the* 20*th June* 1866.)

A. Grote, Esq., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The following Gentlemen were elected Members :—

Messrs. C. H. Lane, Richard Tregear, George Butt, Weston Parry, Adolphus Wallace, J. F. Cockburn, Haines Wickes, F. T. Rice, and Major W. Macdonald.

The names of the following Gentlemen were submitted as Candidates for election :—

Lieutenant and Adjutant E. Bruce, 37th Madras Grenadiers, Cuttack,—proposed by Lieutenant-Colonel W. G. Owen, seconded by the Secretary.

J. Glass, Esq., Civil Surgeon, Cuttack,—proposed by Mr. H. C. Levinge, seconded by Mr. R. Alexander.

Arthur Yardley, Esq., c. s., Govindpore,—proposed by Dr. John Anderson, seconded by Mr. Grote.

Geo. K. Webster, Esq., c. s., Balasore,—proposed by Mr. Joseph Armstrong, seconded by the Secretary.

Major-General E. A. Cumberlege, Mussoorie,—proposed by Mr. D. C. Gordon, seconded by Mr. Alexander Stuart.

Baboo Tarrucknauth Dutt, Calcutta,—proposed by Baboo P. C. Mittra, seconded by Hurroo Chunder Ghose Bahadoor.

Secretary Government Garden, Muttra,—proposed by Major G. T. Gough, seconded by the Secretary.

Captain O. Fitzgerald, Tea Planter, Byjnauth, Kangra,—proposed by Mr. F. Halsey, seconded by Mr. Grote.

The Rev. J. Cave-Brown, Calcutta,—proposed by Mr. Grote, seconded by the Secretary.

The following Contributions were announced:—

1. Memoirs of the Geological Survey of India, Vol. V, Part 2,—by the Government of Bengal.

2. Records of the P. W. Department, Government of India, No. 6,—by the Government of Bengal.

3. Catalogue of Seeds collected in the Botanical Gardens, Calcutta, in 1865-66,—by Dr. Wm. Anderson.

4. Journal of the Asiatic Society of Bengal, Part I, No. 1, and Part II, No. 1 of 1866,—by the Society.

5. Reply to an Article in the *Calcutta Review*, for 1866, entitled "Cinchona Cultivation in India." By Clements R. Markham,—presented by the Author.

6. A small supply of plants of *Araucaria Bidwelli* and *A. excelsa*,—by the Acclimatisation Society of Melbourne.

7. A small quantity (30 seers) of Acclimatized Carolina Paddy,—by the A. and H. Society of Madras.

8. A small quantity (23 seers) of Carolina Paddy and some Peruvian Maize said to be peculiar to Cuzoc,—by Dr. Forbes Watson of the E. I. Museum. The following is the composition of this Maize:—

	Per Cent.
Moisture	11·29
Nitrogenous Matter	9·32
Starchy do.	72·12
Fatty do.	4·19
Fibre	1·60
Ash	1·48
	100·00

9. A packet of Guinea grass seed grown at the Ossoor farm by the Madras Government,—by Dr. H. Cleghorn.

10. Seed of *Cleome speciosa* gathered at Hazareebaugh,—by Major W. S. Row.

11. Seed of Custard Vegetable Marrow and *Helianthus macrophyllus giganteus*,—by James Cowell, Esq.

12. Specimens of Gum of the "Lolam lota," and "Koorta" of Cachar,—by C. Brownlow, Esq.

The following are extracts of Mr. Brownlow's letter regarding these gums:—

"I have the pleasure to forward two specimens of the Gum of the "Coortah" tree.

One specimen was simply inspissated over a hot-water bath without the addition of either alkali or acid.

The other was treated with hyphosulphite of soda; the contained Hyphosulphite being afterwards decomposed by the addition of dilute sulphuric acid in order to precipitate the sulphur in intimate combination. I did this to try if I could not overcome the sticky and glutinous nature of the substance, but it seems to have no affinity for extraneous substances; and has, I believe, parted with the sulphur in the course of subsequent washing. Gum Lac incorporated with it at a heat somewhat above boiling water, was also similarly rejected; perhaps some Chemist may be induced to try the vulcanising process on a portion of it.

Although it resembles Gutta Percha in the property of softening under the influence of boiling water, it does not seem to have the feel, the scent, nor yet the rigidity of that substance.

The tree is abundant in the district in virgin forests, and bleeds freely if tapped when the sap has ascended.

It also, it would seem, belongs to the order Sapotaceæ, to which the Gutta Percha also belongs, and will probably be found to be nearly allied to the Mowah of the North-Western Provinces. The North-Western Coolies here in Cachar call it by the same name, *viz.*, Mowah, but there are, I believe, considerable differences in the leaves; which, in the Cachar tree are smaller, as are likewise the flowers; the latter also, though edible, are not so sweet as those of the true Mowah. "Coortah" is merely a local name.

If requisite, I dare say, I could procure a larger sample for experimentalising on."

In a subsequent letter Mr. Brownlow observes :—

"I hope you received the package of Gum (Coortah). I am afraid from a specimen I have with me, that it is rather too bird-limy, and does not consolidate sufficiently in warm weather, but there is no saying what sort of a material the vulcanizing process may change it into. Whilst looking in the jungles for other Gums, I have again stumbled across that Climber, the seeds of which I sent you a couple of years ago, and which I hope germinated—the Lolam. You, on the authority of Dr. Anderson, I believe, told me it was either a *Sapota* or a *Sideroxylon*; the Gum, you will perceive from the enclosed specimens, is more like Gutta Percha than that of the wild Mowah, and it bleeds very freely, and a good quantity of sap may be collected if the incisions be made in the evening.

This is, I believe, the identical Gum which was sent down by Mr. Sandeman of Munniepore some years ago, and reported on by Dr. Barry, but I believe it had not a fair trial, and that the only way of arriving at the true value of these Gums is by forwarding large samples home to England to be experimentalized on there."

It was agreed to request Mr. Brownlow to send much larger specimens of both these Gums to forward to England for report and valuation.

13. Several samples of Cotton raised from foreign and acclimatized seed,—by A. Grote, Esq.

14. Several samples of Cotton raised in the Society's Garden, from hybridized seed received from Major Trevor Clarke, through Dr. Bonavia.

(Referred to the Committee for report.)

15. Two specimens of Wool,—by J. A. Crawford, Esq.

16. Cocoons raised from Japan Silk Worms' Eggs,—by Captain Thomas Hutton.

(Particulars regarding this Wool and Cocoons will be found in the body of the Journal.)

Read a Report from a section of the Silk Committee (Messrs. E. G. Buskin, and T. R. Grant,) on the samples of Japan Silk laid before the last Meeting. Mr. Buskin reports that they "are of the finest and best description of Mybash (called in London Dyepots) and worth in the London and Continental markets about 15 per cent more than the best Bengal Silk." Mr. Grant considers it "beautiful Silk; quality in every respect first-class; nominal value by last London advices 33*s.* 6*d.* per lb. The best 'Bengal' being then nominally worth 30*s.* 6*d.*"

Read also an opinion by Dr. Thos. Anderson on the Arrowroot submitted at the last Meeting by Mr. Galopin, as grown and manufactured at Chandernagore. "The Arrowroot is of good quality and is pefectly pure. The starch grains are well developed, and readily swell up when mixed with water."

Read a letter from Captain John Temple, Secretary of the Agricultural and Horticultural Society of Saugor, regarding the receipt of plants from England. (See body of the Journal.)

Read a memorandum from Mr. J. A. Crawford, in reference to the samples of Wool already alluded to. (See body of the Journal.)

The following letters were also read:—

1. From J. H. Gouldhawke, Esq., forwarding paper (No. 2,) on the Improvement of the Manufacture of Indigo. (Transferred for publication in Journal.)

2. From J. J. Gray, Esq., a few more particulars respecting the flowering of the Bamboo (*Bambusa spinosa*) in the Malda District. "Mr. Ravenshaw, our Magistrate, writes me that the result of his enquiries are, that the same species of Bamboo flowered in two successive years in the same tract of country, in the Bengal years 1243 and 1244; that he receives different accounts as to those being years of scarcity; some say they were, others the contrary."

3. From Messrs. Mackillop, Stewart & Co., Managing Agents, Dehing Tea Company, Assam; Messrs. W. Moran & Co., Secretaries, Central Cachar Tea Company; J. H. Donald, Esq., Manager, Scottish Assam Tea Company; R. C. Bell, Esq., Manager, Sylhet and Cachar Tea Company; and S. Turnbull, Esq., Manager, Sylhet Tea Company,—in reply to Society's Circular in respect to the yield of Tea per acre in the various Tea Districts of India.

Resolved—That these be retained pending the receipt of other replies, when the whole can be arranged in a tabular form.

4. From Messrs. D. Landreth and Son, Philadelphia, advising the despatch, *viâ* Liverpool, of the Society's annual consignments of Vegetable Seeds.

5. From Messrs. James Carter & Co., London, enclosing Bills of Lading for the Society's annual consignments of Vegetable and Flower Seeds per *Roxburgh Castle* and *British Prince.*

Monthly Proceedings of the Society.

(Wednesday, the 18*th of July,* 1866.*)*

A. Grote, Esq., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The Gentlemen proposed at the last Meeting were elected Members :—

Messrs. J. Glass; Arthur Yardley; G. K. Webster; Major General E. A. Cumberlege; Baboo Tarucknauth Dutt; Secretary, Government Garden, Muttra; Captain O. Fitzgerald; Lieut. E. Bruce, and the Rev. J. Cave-Browne.

The names of the following Gentlemen were submitted as candidates for election :—

Boyle Henslowe, Esq., Civil District Engineer, Roy Bareilly, Oude,—proposed by Mr. Thomas Wilson, seconded by the Secretary.

F. C. Cooke, Esq., Opium Department, Ghazeepore,—proposed by Mr. Thomas Wilson, seconded by the Secretary.

J. W. Stocks, Esq., Berhampore,—proposed by Mr. Grote, seconded by Captain W. L. Knyvett.

R. V. Stoney, Esq., c. e., Hidgelee,—proposed by Mr. J. C. Vertannes, seconded by Mr. J. H. Johnston.

Secretary, Public Garden, Oorae (Jalown),—proposed by Mr. Grote, seconded by Mr. W. Stalkartt.

R. P. Sage, Esq., Chowkeedangah, Raneegunge,—proposed by Mr. A. S. Sawers, seconded by the Secretary.

W. F. McDonell, Esq., c. s., Kishnaghur,—proposed by Mr. C. Hobhouse, seconded by Mr. Grote.

Mr. John Lynam, Superintendent, Reserve Police Force,—proposed by Baboo Kaliprosunno Sing, seconded by the Secretary.

Baboo Digumber Mitter, Calcutta,—proposed by Mr. Grote, seconded by Baboo Peary Chand Mittra.

Koomar Koomudnauth Roy, Nattore,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

W. H. Cogswell, Esq., Calcutta,—proposed by Mr. W. Stalkartt, seconded by Mr. S. H. Robinson.

The following contributions were announced :—

1. Journal of the Royal Asiatic Society of Great Britain and Ireland, Vo. 2, Part 1,—from the Society.

2. A general list of Native Implements and Industrial Articles, &c., compiled by Rajah Kali Krishna Bahadoor,—from the Compiler.

3. A small quantity of acclimatized Radish seed raised in the Public Garden at Cawnpore,—from W. H. Halsey, Esq.

4. Six Chrysanthemums of new sorts, recently received from England,—from G. Livesay, Esq.

5. A small quantity of double Zinnia Seed, raised in the Public Garden at Benares,—from J. H. Bax, Esq.

6. Seeds from Melbourne of *Araucaria Cooki*, and *Pittosporum Eugenoides*,—from Dr. F. Mueller, Superintendent, Royal Garden, Melbourne.

7. A skein of Silk from Japan stock raised at Berhampore,—from F. Lagarde, Esq.

Mr. E. G. Buskin, a Member of the Silk Committee, reports on this sample as follows:—

"Good color and quality, even, clean thread, and well reeled, size 12 to 15 deniers, a very desirable silk, and as good as any produced in Bengal. Present value about Rs. 21 to 22 per factory seer."

CAROLINA PADDY.

A memorandum was read from the Gardener showing a germination of 90 per cent of the Carolina Paddy (imported and acclimatized), which was submitted at the last Monthly Meeting.

The Secretary also read the following directions from Mr. C. E. Blechynden, for the cultivation of this description of Paddy:—

"Sow in a seed bed as soon as the rains have fairly set in. By seed bed I mean the way in which the natives prepare the young plant for transplanting. The ground in which the Paddy is to grow should be well manured and the dams all round raised, as this kind of Paddy requires water always at the roots, and that some 4 or 5 inches deep. Transplant as soon as the seedlings are 6 to 8 inches high, plant two or three together and about 4 inches apart, do not have the plants of each row opposite each other but in *quincunx* fashion. About the 15th of October, or as soon as the grain has well filled, begin to let the water off, not all at once, but when ripe. Four seers and a half of seed will suffice for a beegah."

Baboo Joykissen Mookerjee proposed that an attempt should be made to procure from Assam a variety of Paddy Seed, the produce of which can be prepared by sun-heat. Agreed to. He also referred to a particular kind of Paddy which, it is stated, will grow under water 2 or 3 feet deep, whether sown *in situ* or transplanted, and suggested that the subject be referred to in the Proceedings with the view of eliciting further information.

DEFAULTERS TO THE SOCIETY.

The Council submitted the names of the following two Gentlemen who had failed to respond to calls made on them for their subscriptions, *viz*:—

Mr. A. S. Urquhart of Poopry Factory, Tirhoot, and Mr. W. H. Smith, of Bongong Factory, Tirhoot. Agreed that their names be inserted in the present Proceedings as defaulters.

COMMUNICATIONS ON VARIOUS SUBJECTS.

The following papers were submitted :—

1. From F. Lagarde, Esq., submitting a report of experiments made at Berhampore on Japanese Silk Worms' eggs.

2. From Dr. E. W. Bonavia, forwarding some remarks on the subject of acclimatization, and on the culture of the Malta Orange and Lemon.

3. From Dr. H. Cleghorn, submitting observations by Mr. W. G. McIvor, Superindent, Government Cinchona Plantations, on the germination and growth of Seed of the Medicinal Cinchonas.

The above three papers were transferred for publication in the Journal.

4. From Dr. Geo. Henderson, Secretary Agricultural and Horticultural Society of Lahore, suggesting the compilation of a general list of all the useful Plants of India.

The Secretary mentioned he had, at the suggestion of the Council, brought to Dr. Henderson's notice the works published by Colonel Drury and Dr. Birdwood, as affording much information of a practical nature on this subject.

5. From Messrs. W. H. Smith, Barry & Co., giving particulars, as received from the Manager of the Debrooghur Tea Company, on the yield of Tea per acre, in reply to the Society's Circular.

6. From S. P. Griffiths, Esq., London, respecting the collection of Rose plants sent last year by Mr. William Paul, of Waltham Cross. Mr. Griffiths mentions that Mr. Paul is not prepared to make any conpensation for this very bad collection. *Resolved,*—that no further orders be sent to Mr. Paul.

7. From the Secretary, Royal Asiatic Society, returning thanks for certain Publications of this Society.

8. From Messrs. Law, Somner & Co., Melbourne, advising despatch per *Aurifera* of the usual annual consignments of Cereals and other field seeds.

(Friday, the 24th August, 1866.*)*

A. GROTE, ESQ., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The Gentlemen proposed at the last Meeting were elected Members, *viz* :-

Messrs. Boyle Henslowe; F. C. Cooke; J. W. Stocks; R. V. Stony, C. E.; R. P. Sage; W. F. McDonell, C. S.; John Lynam; W. H. Cogswell; Baboo Digumber Mitter; Koomar Koomudnauth Roy; Baboo Chunder Caunt Mookerjee, and the Secretary, Public Garden, Oorae.

The names of the following Gentlemen were submitted as Candidates for election:—

F. Lagarde, Esq., Silk Manufacturer, Berhampore,—proposed by Mr. E. Molony, seconded by Captain W. N. Knyvett.

Dr. H. E. Fox, Civil Surgeon, Jaunpore,—proposed by the Secretary, seconded by Mr. R. Blechynden.

C. Nickels, Esq., Indigo Planter, Jaunpore,—proposed by Mr. E. J. Atkinson, seconded by Mr. R. Tregear.

The Rev. James Smith, Delhi,—proposed by the Secretary, seconded by Dr. C. Fabre Tonnerre.

W. H. Thompson, Esq., C. S., Dacca,—proposed by Mr. H. Krauss, seconded by Mr. George Ruxton.

Jocelyn F. Watkins, Esq., Solicitor, Calcutta,—proposed by Mr. Joseph Agabeg, seconded by the Secretary.

Alfred Hobday, Esq., Merchant, Moulmein,—proposed by Mr. D. G. Nicolson, seconded by Mr. J. A. Crawford.

E. Drummond, Esq., C. S., Patna,—proposed by Mr. A. C. Howard, seconded by the Secretary.

Randle E. Green, Esq., Merchant, Calcutta,—proposed by Mr. Joseph Agabeg, seconded by Mr. R. Blechynden.

Moonshee Mahomed Alli Khan, Government Pleader, Dinagepore,—proposed by Dr. H. C. Bowser, seconded by the Secretary.

Dr. S. J. Manook, Civil Surgeon, Chyebassa,—proposed by Dr. W. H. Hayes, seconded by Mr. J. Agabeg.

Cecil Stephenson, Esq., Agent, E. I. Railway,—proposed by the Secretary, seconded by Mr. Agabeg.

J. E. Tanner, Esq., Delhi Railway, Loodiannah,—proposed by Dr. David Scott, seconded by Mr. S. H. Robinson.

H. Rait, Esq., Gonatea,—proposed by the Secretary,—seconded by Mr. R. Blechynden.

W. J. Millie, Esq., Tea Planter, Chittagong,—proposed by Mr. E. Broughton seconded by Mr. M. Henderson.

Arthur H. Mowbray, Esq., Calcutta,—proposed by Mr. H. Krauss, seconded by Mr. George Ruxton.

J. P. Langlois, Esq., Tea Planter, Chittagong,—proposed by the Secretary, seconded by Mr. S. Jennings.

W. C. Fairley, Esq., Merchant, Chittagong,—proposed by Mr. R. Macalpine, seconded by the Secretary.

Thomas Tayler Allen, Esq., C. S., Tipperah,—proposed by Mr. S. H. Robinson, seconded by Mr. Grote.

Henry H. Jewett, Esq., Tea Planter, Seebsaugor, Upper Assam,—proposed by Mr. C. H. Lane, seconded by the Secretary.

A. P. Macdonell, Esq., C. S., Monghyr,—proposed by Mr. W. L. Heely, seconded by Dr C. Fabre Tonnerre.

The following contributions were announced:—

1. Catalogues of the organic remains of the Cephalopoda and of the Meteorites, also Annual Report of the Geological Survey of India, 10th year, 1865-66,—from the Superintendent.

2. Report of the Committee of the Bengal Chamber of Commerce, from November 1865 to April 1866,—from the Chamber.

3. Records in the P. W. Department, Report No. 7, Progress Report of Forest Administration of British Burmah, 1864-65,—from Government of Bengal.

4. Annual Reports of the Bombay and Madras Presidencies, Mysore and Coorg, Central Provinces, and Andaman Islands, for 1864-65,—from Government of Bengal.

5. A small collection of acclimatized vegetable and flower seeds, from the Lucknow Public Garden,—from Dr. Bonavia.

6. A plant of *Dammara Australis* and some seed of *Collvillea racemosa*,—from W. Stalkartt, Esq.

7. A sample of "Rheea" fibre grown and prepared at his estate at Morrelgunge, Jessore,—from H. G. Morrell, Esq.

The Secretary mentioned that this sample was fully equal to any that had been received by the Society from Assam or elsewhere during the last 25 years, and was in just the condition required by spinners in England. The value, by recent advices, is about £80 per ton. Mr. Morrell is not able yet to say what the expense of preparation will be on a large scale, but judging from the cost of a small quantity, he is of opinion it will be some thing considerable, the hand process being so slow. The stalks from which the sample is obtained were cut when between five and six weeks old, and prepared in its green state.

A memorandum was submitted from the Gardener. Mr. Errington reports that the packet of seeds of *Clianthus Dampieri* received from Messrs. Law and Somner of Melbourne in June, produced only 8 plants which lived for two days. Last cold season plants were raised from 4 to 6 inches high, but although very healthy they died off in a day. There are as yet no signs of germination, Mr. Errington mentions, of any of the seeds of *Araucaria Cooki*, which were received from the Acclimatisation Society of Melbourne some time ago. Mr. Errington further reports that 52 more Roses have died of the consignment received last cold season from Messrs. Vilmorin of Paris, and 15 more of Mr. Paul's stock. The Gardener adds that he has for distribution a large stock of Crotons, and several plants of *Erythrina Bakeri*, *Salix Babylonica (Willow)* and *Asclepias curasavica*.

The Secretary reported that, in accordance with the recommendation of the Cotton Committee, he had transmitted by a recent mail the various samples of

Cotton raised in the Society's Garden from the hybridized seed received last year from Major Trevor Clarke, through Dr. Bonavia. The parcel had been addressed to Mr. T. H. Mosley (a Member of the Committee,) now in Manchester, with a request that he would kindly report on quality and value, and then transfer such report with the samples direct to Major Clarke, at Daventry.

FLORA AND VEGETABLE PRODUCTS OF MURREE.

The Secretary submitted the following interesting remarks from Mr. H. Cope, in continuation of those read at the Monthly Meeting in May last :—

"I think I told you that my first impressions of Murree were not favorable, The climate was bleak, the temperature low, and the weather inclement. But five weeks' experience has reconciled me to the place; the advancing season has done much to develope its beauties, and they are not a few. The woods in the neighbourhood are numerous and picturesque. The views might, perhaps, be termed tame, on the whole, were it not for the relief afforded by the forest scenery, in some parts really fine, the tall, straight, slender Pines, the several species of Oak struggling into branches where the Pines will allow, and vying with them in height; the beautiful Maples, of which two or three species grow here, and whose seeds, with their colored wings, look at a distance more like handsome flowers; the Holly with its bright shining leaves, that attains a very large size, many of the stems covered with Ivy from bottom to top, and such Ivy! some of it with stems the thickness of a man's arm, and ever-varying in its luxuriantly green leaves, according to soil and situation, so much so that one might be induced to consider them as belonging to different species, were it not that the shape and varieties are frequently found on the same plant. As usual in the Himalayan outer ranges the forest growth is stunted on the south and eastern slopes of the hills, but fully developed on the north and west, the general inclination of the geological formation drawing the streams or percolations in that direction. The soil of Murree is well suited to garden operations where it is deep enough, while the addition of the forest mould,—in many places very deep—would, if more extensively used, add materially to its fertility; but the want of an ample supply of water is a serious drawback to horticultural pursuits in these parts. The evaporation is so rapid, that large supplies of moisture are required, and these are not forthcoming at present. The consequence is, that the flower-bearing shrubs and annuals cultivated in gardens, and especially those in pots, want that luxuriance that distinguishes the parterres of the plains during the winter and spring seasons. Tanks of great depth and small surface, to prevent too rapid evaporation, should be provided by the local authorities in all the higher parts of the Station, with drains from all sides, to secure the largest available afflux of water, whenever it rains, and every house proprietor should make similar arrangements on the highest parts of his estate. They would pay if they only saved water-carriers. The addition, to the natural soil, of the forest mould, would ensure a longer retention of water, and

1. proprietors or tenants who pay any attention to gardening, would but establish such tanks and put everything into the ground, they would ensure "crops" of flowers and vegetables that are now unknown here. The soil is left much too shallow for vegetables, and the consequence is, that the Cabbage and Lettuce tribe form no good heads, and the root plants don't strike deep enough, while the herbs and flowers, in the small pots made here, have so little room to expand their roots, and the little water they receive is so speedily absorbed by evaporation through the porous material, that they look stunted, dried, and unnatural. The chief attraction of the place is at present in the vast clusters of White (Dog) Roses that meet the eye at every turn, climbing, in some instances, like the Ivy, to the very tops of trees of all kinds, even Pines of the smaller growth, and most undoubtedly add greatly to the beauty of the forests, the glades, and the shrubbery. Hardly a tree that cannot boast of its attendant Rose, and whose own special claim to attention is not improved by the brilliant glossiness of the clustering climber. As the season advances, the annuals that were so attractive by their associations with the old country, gradually disappear, and they are replaced by others of a more tropical character, though the European type is prominently preserved in some few of the plants. The beautiful MORINA, vying in appearance with the handsomest of its tribe, flourishes by the side of the dark blue Myosotis, while several members of the family of SCROPHULARINEŒ are to be found under the branches of the elegant Indigofera growing all over the hills. The RANUNCULUS is, as usual in the Hills, abundant in the water rills, while dried plots are affected by two elegant species of St. John's wort.

I have frequently visited the Vegetable and Fruit market, and been astonished at the quantity and cheapness of some items. Potatoes that, some thirteen years ago, had never been heard of by the hill people, are now cultivated so largely in the neighbourhood as to have made them a staple with which many stations in the plains, from Peshawur to Lahore, are supplied by Murree. You may form some idea of the cultivation when I tell you that the finest and largest are sold here at from one rupee to one rupee four annas per maund, and inferior ones at from 10 to 14 annas for the same weight. Were the means of conveyance available I feel assured that Murree on this side, and Dalhousie and Dhurmsala to the east would materially contribute, in Potatoes alone, to abate the horrors of famine tha now and then sweep the land; while they would at all times furnish a cheap an wholesome addition to the food of the people in ordinary times from Rawul Pinde and Jullundur to Kurrachee.

Of other Vegetables, the greater part are brought up from Rawul Pindee where the Squash is so largely cultivated as to have become a common article o produce, from Hazara and other places, but there is nothing deserving of especia notice. Of fruits the Apricot at present bears the palm, and most deservedly. I is said to be grown all over the Hills and is sold in the bazaar at from two anna per seer for the small jungly kind called *Aree*, to 8 annas for the fine grafte in his opinion, Tea cultivation was as yet so much in its infancy, that he believed it possible to improve greatly on it. Manuring, he believed, had only very rarely been practised, owing principally to the expense and the difficulty of obtaining the material in sufficient quantities. No doubt in some soils it would be very useful, but results, such as mentioned in Mr. Gibson's letter, had been achieved in some gardens without the aid of manure, each individual plant being 12 feet in diameter. But this extraordinary yield is only very partial—say 3 or 4 picked acres well attended to. Such a thing, he believed, had never been heard of as a Garden of 60 to 100 acres averaging all over 1,000 lbs. per acre. The most he had ever heard of was 11 maunds per poorah, equal to about 700 lbs. per acre on an average; which is, indeed, a splendid return. Mr. Jennings added that in his opinion a thorough ventilation of the soil by deep-hoeing is more important than manuring. He thought, also, that much might be done in the way of grafting, say a China graft on an Assam stock, which would probably produce a very superior leaf. He was not aware that such an experiment had ever been attempted.

In reply to a question of the President as to the probability of the decay of old plants after a lapse of years, Mr. Jennings mentioned that he had seen a patch of Tea near Nazeerah, in Upper Assam, raised from China seed 20 years ago; the leaf in course of time had quite changed its appearance, instead of being small and dark it had become quite light in colour, and having all the appearance of Assam leaf, had, in fact, become naturalized; this curious change had not affected its producing capabilities, which were not greater than two or three maunds per acre.

ARTIFICIAL MANURES.

In connection, somewhat, with the above subject, the Secretary next read the following letter from Messrs. Thomson and Mylne, Managers of the Jugdispore Estate, at Beheea, on the subject of artificial manures:—

"We send by this post a copy of a little work by M. Ville, in which that Gentleman advocates the use of "Chemical Fertilizers" in preference to farm-yard manure, and gives the results of experiments made at Vincennes.

Our Mr. Mylne, when in England last year, had his attention called to this system by a friend who formerly resided in India and who is now farming in Yorkshire.

This Gentleman had been trying the system on a small scale with Barley, the result being 80 bushels grain and 418 stones of straw per acre off land the usual yield of which is seldom over 35 or 40 bushels.

The cost of the normal or complete manure was £12 per acre, and the Farmer was so well pleased with the result obtained that he at once decided on treating in the same way about eight acres of autumn wheat.

We are at present unable to give the exact yield of this, but it also has turned out very satisfactorily.

We are not aware whether or not the attention of your Society has been directed to this or any such system of manuring, but we have long felt the great want in India of some manure, obtainable in quantity, equal to the requirements, and at a price within the reach of the Koyroos, Koormees, and other good farmers of this locality.

There is no doubt that such manure would be highly valued and advantageously applied by the men we refer to. They grow the bulk of the poppy for Government, and this, which is only one item of their cultivation requiring manure, amounts to upwards of 20,000 acres in Shahabad alone.

The system of farm-yard manure as practised in England and Scotland, is of course impracticable here, as the small holdings and general "hand to mouth" condition of the ryots prevents anything like stock farming which would produce manure, and the lack of manure thus resulting is aggravated by the practice which generally prevails of using cow-dung as fuel.

We are trying to introduce on the Jugdisporo Estate the use of ingredients such as M. Ville describes, and we believe that ingredients containing all the chemical properties necessary will be obtainable in India at very much lower prices than in England or France.

Ville's complete manure for an acre is composed of:—

1.—80lbs. Nitrogen in the form of Saltpetre, Nitric Acid, Carbonate of Ammonia, or Salamoniac.

2.—176lbs. Phosphoric Acid in the form of Phosphate of Lime, Bone-ash, &c.

3.—176lbs. Potash or Potassia in the form of Carbonate.

4.—176lbs. Caustic Lime.

As far as we know, the cheapest form in which Nitrogen is obtainable is the Saltpetre of commerce, and though it is rich in both Nitrogen and Potash, containing 14 per cent of the former and 50 per cent of the latter, the quantity required is 7½ maunds per acre. In giving the full dose of Nitrogen, more than the necessary quantity of Potash is obtained at the same time, and Bone-dust and Lime can be obtained in some parts of India at comparatively little expense, but the Nitrogen and Potash alone in this the cheapest form we at present know of, will not cost less than 25 to 30 per acre, which, though very cheap for England or Scotland, is much too expensive for the Indian cultivator at present. "Nausadur," we are informed, contains Nitrate of Soda, but it seems to be more expensive than Saltpetre.

Indigo Seetee is known to be a rich manure, and we had it analyzed lately in Calcutta.

From the analysis it appears that the ash contains 10 or 12 per cent Phosphate of Lime, 35 per cent Carbonate of Potash, and nearly 4 per cent Sulphate of Lime, thus with the addition of a little Phosphate of Lime and the necessary quantity of Caustic Lime and Nitrogen, it forms a "Complete Manure." This is an instance which shows how one or more of the necessary elements may be easily obtained and the only want in this case is a cheap source of Nitrogen.

Ville states that Felspathic rocks contain Potassa, and that in Orthose there is 14 per cent.

At page 78 and 79 he mentions Apatite as a source of Lime Phosphate; it forms, he says entire mountains in Spain, and is easily prepared for the purposes of Agriculture. It would be very desirable to obtain a specimen of this rock, possibly it might lead to the discovery of the same mineral in India, or some other containing the same elements or their equivalents.

In the Kymore Hills, 60 miles south of us, there are vast quantities of Lime and Chalk of various qualities, and it is not unlikely that Apatite or its equivalent may be found there.

We have in progress a couple of experiments on a small scale; one, using the Nitrogen and Potassia of Saltpetre in conjunction with Phosphate of Bone-ash and Quick Lime in the proportions given by Ville.

The other at the rate of 517 lbs. of Indigo Seetee ash, 257 lbs. of Bone-ash, 176 lbs. of Quick Lime per acre, the Nitrogen in this compound being completely absent; besides these there is a bed sown with the same seed, and at the same time, but without manure.

We will be obliged by your bringing the subject before your Society and by your affording us any information and assistance you can in your endeavour to obtain a suitable and cheap manure."

Agreed that this valuable communication be inserted in the Proceedings and that information be invited on the important subject to which it refers. Further, that Messrs. Thomson and Mylne be requested to favor the Society with the result of their experiments.

COMMUNICATIONS ON VARIOUS SUBJECTS.

The following letters were also read:—

1. From the Rev. T. C. Ferminger, Gowhattee, in reference to the enquiry made at the last Meeting by Baboo Joykissen Mookerjee, respecting a variety of Paddy grown in Assam, the produce of which can be prepared by "sun heat."

Mr. Ferminger had applied to General Jenkins on the subject, who writes as follows:—

"I am sorry to say I can give you no clue whatever to the kind of rice Mr. Blechynden refers to; I never heard of any such.

Our people constantly eat uncooked rice, just softened in cold water, but that, I suppose, they do throughout Bengal.

In all the eastern countries, and I think among the tribes of our eastern hills, it is quite common to cook rice in Bamboo *choongahs*, over a fire without using water, but I never heard of the heat of the sun being substituted for fire. The kind of rice so dressed becomes a sort of glutinous jelly, and perhaps it might be reduced to this state in a fierce sun, the end of the *choongah* being well stoppered, but I am not aware that it is so treated.

I am sorry I can refer you to no one in Assam that is more likely to give the information required."

Mr. Ferminger adds:—"I will nevertheless make further enquiries from one or two well informed natives I am acquanted with, and if I learn any more from them on the subject, I will let you know directly."

2. From C. E. Blechynden, Esq., on the same subject.—"There is a description of paddy called "Peeprasaul," procurable at Kajnan and Ramchunderpore, Zillah Hooghly, Pergunnah Jehanabad, of which the grain is very fine. If steeped in cold water a short time it softens and becomes like boiled rice. I should say that if placed in water and exposed to a hot sun, the grain would become like boiled rice. It swells a great deal in cooking."

3. From Dr. Geo. Henderson, Secretary Agricultural and Horticultural Society, Punjab, of which the following is an extract:—

"In the Punjab we have some difficulty in getting a good supply of leaf mould so necessary to the successful rearing of seedling plants in pots or for getting delicate seeds to germinate. The leaves of all Punjab trees are eaten up by cattle, the moment they fall, and I wish to grow a crop to be cut down for the purpose of forming leaf mould. If you notice this in your Proceedings, perhaps some Member of the Society may be able to suggest to me a plan which would answer this purpose well, and one which produces a large quantity of foliage, and soon reproduces it when cut down. I also wish to know how leaves and such like can be most easily charred to render them fit for use, and thus enable one to use them at once instead of waiting for 18 months until they rot."

The Secretary mentioned that he had given the names of several trees to Dr. Henderson, which he thought might answer the purpose, such as *Murrya exotica*, *Nycthanthes arbor tristis*, *Lawsonia inermis*, *Erythrina* of sorts, &c., and had recommended the use of lime to convert the produce thereof quickly into leaf mould.

4. From Monsr. A. Jacquemenic, Officiating French Consul, seeking for certain particulars, in connection with the raising of Silk in India, on behalf of the Silk Commission recently instituted in France.

The Secretary mentioned he was preparing the required information.

5. From Officiating Inspector General of Forests, a paper descriptive of insects which are destructive of Wood and Forests.

6. From F. Halsey, Esq., Cawnpore, applying for the loan of the large Saw Gin (Carver & Co.,) for trial at his station. Agreed that the application be granted on certain conditions as to time and return in same order as received, &c.

For the above communications and presentations the best thanks of the Society were accorded.

(Wednesday, the 26th September 1866.)

S. H. Robinson, Esq., *Senior Member present, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The Gentlemen proposed at the last Meeting were elected Members, *viz*:—

Dr. H. E. Fox; the Rev. James Smith; Messrs. F. Lagarde; C. Nickels; W. H. Thompson, C. S.; Jocelyn F. Watkins; Alfred Hobday; E. Drummond, C. S.; Randle E. Green; Moonshee Mahomed Alli Khan; Dr. S. J. Manook; Messrs. Cecil Stephenson; J. E. Tanner; H. Rait; W. J. Millie; Arthur H. Mowbray; J. P. Langlois; W. C. Fairley; T. T. Allen, C. S.; Henry H. Jewett, and A. P. Macdonell, C. S.

The names of the following Gentlemen were submitted as candidates for election:—

G. S. Goad, Esq., Manager, Assam Company's Dubba Division, Seebsaugur,—proposed by Mr. C. H. Lane, seconded by the Secretary.

Wm. Ridge, Esq., Barrogurreah Silk Filatures,—proposed by Mr. J. J. Gray, seconded by Mr. W. Stalkartt.

Walter L. B. Granville, Esq., C. E., Consulting Architect, Government of India,—proposed by Mr. T. R. Mellor, seconded by Mr. Joseph Agabeg.

T. H. H. Shortt, Esq., C. S., Bhuddruck,—proposed by Mr. G. A. D. Anley, seconded by Mr. W. Pigott.

A. Stirling, Esq., Alipore,—proposed by Mr A. Grote, seconded by Mr. J. A. Crawford.

Baboo Radharomun Dutt, Calcutta,—proposed by Baboo Peary Chand Mittra, seconded by Baboo S. C. Deb.

J. Deveria, Esq., Zemindary Manager, Bengal Coal Company, Raneegunge,—proposed by Mr. S. H. Robinson, seconded by Mr. R. P. Sage.

Manager, East India Tea Company, Cachar,—proposed by Mr. R. Blechynden, seconded by Mr. S. H. Robinson.

H. H. Locke, Esq., Principal, Government School of Acts,—proposed by Mr. Grote, seconded by Mr. S. Jennings.

Geo. Brown Smith, Esq., Manager, Lacknah Tea Concern, Seebsaugur,—proposed by Mr. C. H. Lane, seconded by the Secretary.

Baboo Nobeen Chunder Nag, Zemindar, Midnapore,—proposed by Baboo P. C. Mittra, seconded by Baboo S. C. Deb.

S. N. Smellie, Esq., Merchant, Calcutta,—proposed by Captain C. Burbank, seconded by the Secretary.

A. G. Grote, Esq., Gonda, Oude,—proposed by Mr. Grote, seconded by Mr. Crawford.

Thomas Hindmarsh, Esq., Eastern Bengal Railway, Kunchrapara,—proposed by Mr. James Brander, seconded by the Secretary.

Anthony Edwards, Esq., Mooteeharry, Champarun,—proposed by the Secretary, seconded by Mr. R. Blechynden.

T. C. Dias, Esq., Advocate, Moulmein,—proposed by Mr. D. G. Nicolson, seconded by Mr. A. Lawrie.

T. G. Marsh, Esq., Manager, Murree Brewery,—proposed by Mr. H. Cope, seconded by the Secretary.

H. Freeman, Esq., Salsergah Factory, Tirhoot,—proposed by Mr. T. M. Gibbon, seconded by the Secretary.

A. Badger, Esq., Manager, Beerbhoom Coal Company's Colliery, Mungulpore, —proposed by Mr. A. S. Sawers, seconded by the Secretary.

A. J. Stürmur, Esq., Talooka Kojha, *viâ* Ghazeepore,—proposed by the Secretary, seconded by Mr. Robinson.

C. J. Pittar, Esq., Solicitor, Calcutta,—proposed by Mr. E. G. Buskin, seconded by Mr. J. G. Meugens.

Wm. Wright, Esq., Judge, Small Cause Court, Cuttack,—proposed by Mr. W. C. Taylor, seconded by the Secretary.

The following contributions were announced :—

1. Report of the Commissioner of Agriculture of the United States, for 1864,—by C. H. Foster, Esq., of Boston.

2. Memoirs of the Literary and Philosophical Society of Manchester, vol. 11, 2nd series, and Proceedings, vols. 3 and 4,—by the Society.

3. Annals of Indian Administration, vol. X, Parts 1, 2 & 3,—by the Government of Bengal.

4. Journal of the Asiatic Society of Bengal, Part 1, No. 2, 1866,—by the Society.

5. Selections from the Records of the Government of India, Foreign Department, No. 50,—by the Government of Bengal.

6. A quantity of acclimatized Cauliflower and Artichoke seed, by F. Halsey, Esq.

7. Seed of *Cryptomeria Japonica*,—by W. J. Judge, Esq.

8. A box of Vegetable seeds,—by Messrs. James Garraway and Co., of Bristol.

9. A small selection of plants from the Benares Public Garden,—by J. H. Bax, Esq.

10. Twelve grafts from Roses received last year from Messrs. James Garraway and Co., of Bristol,—by Geo. Livesay, Esq.

11. A sample of Jute from the Goculgunge Fibre Company,—by S. H. Robinson, Esq.

This Jute is considered by Mr. W. Stalkartt (a Member of the Fibre Committee) as of very fair quality, and worth Rs. 4 per maund.

TRIBUTE OF RESPECT TO THE MEMORY OF GENERAL FRANCIS JENKINS AND RAJAH PERTAUP CHUNDER SING.

The Chairman said that the President, who was unable himself to attend the Meeting, asked him to bring forward a Resolution of regret for two recent casualties among the Society's Members, *viz.*, General Francis Jenkins and Rajah Pertaup Chunder Sing. He would first ask the Secretary to read a memorandum which the President had handed him of the connection of the General with the Society.

The memorandum is as follows:—

General (then Captain) Jenkins joined the Society in 1828, when Secretary to the Military Board. His name is found associated with Dr. Wallich, Mr. C. K. Robison and others as a Member of the Garden Committee, and on Special Committees, as formed, more especially on the Committee which was appointed in 1829 to "enquire into the state of the Society and report thereon." After his arrival in Assam, in 1834, General Jenkins was indefatigable in his endeavours to bring to light the agricultural resources of the Province committed to his charge. Though it would not appear that he communicated any lengthy papers himself, he was zealous in encouraging the Officers of the Commission and other residents to bring to the Society's notice subjects connected with Tea, Caoutchouc, Lac, Fibres, &c. He was, moreover, always ready to obtain every available imformation on various questions referred to him by the Society. Indeed, it may with truth be observed that to the General's influence and assistance the Society is indebted for the majority of the papers connected with Assam that have been published in its Transactions and Journal. In the year 1835, General Jenkins communicated his views to Government respecting the cultivation of Tea in Assam; and in 1836 he received the scientific deputation (Dr. Wallich, Messrs. Griffith and McClelland) appointed for the investigation of the Flora of Upper Assam, more especially in relation to the growth of the Tea plant. The result of the labors of two Members of the deputation (Messrs. Griffith and McClelland) was made known to the Public in two elaborate papers which appeared shortly afterwards in the Transactions of the Society. For services thus rendered to the Society for upwards of a quarter of a century, General Jenkins' name was added in 1852 to its list of Honorary Members.

The Secretary then read the following Resolution, which was unanimously agreed to:—

Resolved—That this Meeting desires to place on record its sense of the services rendered to the Society during a long course of years by the late General Francis Jenkins, and to express its regret at the loss which the Society has experienced in his death, as well as in that of Rajah Pertaup Chunder Sing, for several years one of its active Office Bearers.

A report was submitted by the Gardener on the germination of Messrs. Carter and Co.'s vegetable and flower seeds, satisfactory on the whole, though some kinds have not yet vegetated: on these a Supplementary Report will be given. Mr. Errington also furnishes a statement of the number of grafts of fruit trees and ornamental plants that have been prepared during the year, amounting in the aggregate to 10,700, or 3,493 more than in 1865. He likewise gives a memorandum strikingly illustrative of the effect of the damp air of Lower Bengal on seeds. A quantity of *Ipomœa* seeds was gathered in May and June last, a portion of this was immediately placed in a tin box, well soldered down, and the remainder was kept in paper in a basket suspended from the ceiling; of the first nearly every seed germinated; of the second every seed has failed.

In reply to an enquiry from the Chairman in respect to the American vegetable seeds, the Secretary reported that the first half of the consignment was about being landed from the *Altcar*, and that the second was on board the *Derbyshire*, which had not yet arrived. The Seedsmen were instructed in November last, to despatch both consignments direct from Boston in April so as to reach this not later than the commencement of August; whereas they had forwarded both *viâ* Liverpool on the plea that no direct opportunity was available. This would have to be enquired into.

NURSERY GARDEN.

The following correspondence was next submitted in respect to the resumption of the piece of ground used by the Society for the purposes of a Garden:—

To

THE HON'BLE A. EDEN,

Secretary to the Government of Bengal.

SIR,

Letter from Secretary, A. and H. Society, dated 3rd February 1861, to Secretary, Government of Bengal.
Office Memo. No. 3102, of 26th July 1864, from Secretary, Government of Bengal, (with enclosure) to Secretary, A. and H. Society.
Letter from Secretary, Government of Bengal, dated 1st November 1864, to Secretary, A. and H. Society, with enclosure.
Letter from Ditto, of 8th February 1865.
Letter from Secretary, A. and H. Society, dated 28th February 1865.

REFERRING to the correspondence noted in the margin, I have the honor, under instruction from the Council of the Agricultural and Horticultural Society, to request that you will bring to the notice of His Honor, the Lieutenant-Governor, that they have been using their best endeavours, for some time past, but more especially since the commencement of last year, to find a new site for a garden in an eligible position, in place of the garden now occupied by them in the Botanic Garden. Having, however, been unsuccessful in their search for such a site, and taking into consideration the large sum the Society has already sunk in the cultivation of its present Garden, they earnestly request His Honor will be pleased to allow them still to retain such portion of it as has not been transferred to the Superintendent of the Botanic Garden. The total area originally in possession of the Society may be estimated at about 25 acres, and the portion in the N. W. corner, already resumed by Dr. Anderson, may be estimated, the Council believe, at rather more than one-third of that area.

2. In preferring this request the Council do not deem it necessary to enter into any lengthened details in respect to the pecuniary loss the Society would sustain on being obliged to abandon its present locale—though this would be considerable;—and the retrogression necessarily entailed by the loss of an useful experimental garden, which it would take years to replace even if the means were available,—but they now simply base their appeal on the fact, already stated, of their having been unable, after careful and diligent enquiries, to find a site on this side of the river at all suitable for their purpose, within a convenient distance of Government House.

3. The Council earnestly trust, in conclusion, that His Honor will view this appeal in a favorable light, and as the Government of Bengal have always evinced a warm interest in the affairs of the Society, they hope His Honor will, on re-consideration, be induced to withdraw his sanction to a measure which is so much calculated materially to impair the present utility and efficiency of the Institution.

I have, &c.,

Calcutta, May 18th, 1866. (Sd.) A. H. Blechynden,

Secretary, A. & H. Society.

To

The Secretary to the
Agricultural and Horticultural Society.

Dated Darjeeling, the 16th August, 1866.

General.]

Sir,

I am directed to acknowledge the receipt of your letter, dated the 18th May last, and in reply to say, that under the circumstances stated in the enclosed copy of a letter, No.——, dated the 3rd instant, from the Superintendent of the Royal Botanical Gardens, the Lieutenant-Governor is unable to allow the Agricultural and Horticultural Society to retain possession of the piece of the ground now used by the Society in the Gardens.

I have, &c.,

(Sd.) J. Geoghegan,

Offg. Jr Secy. to the Govt. of Bngal.

To

J. Geoghegan, Esq.,
Offg. Jr. Secy. to the Govt. of Bengal.

Dated Darjeeling, August 3rd, 1866.

Sir,

In reply to your endorsement No. 998T, dated the 9th June 1866, I have the honor to inform you that the portion of the Botanical Garden ground occupied by the Agri-Horticultural Society, for restoration of which I applied in my letter No. 46, of the 15th ultimo, is required to enable me to carry on the plan of remodelling the Botanical Garden. This plan has been referred to in all my Annual Reports on the Botanical Garden since 1861-62. I have all along been aware that to complete this plan, I would require the entire extent of the Garden occupied by the Agri-Horticultural Society, but to avoid putting the Society to any inconvenience, I applied in the first place only for so much land as would be required in 1865-66. This piece of land has now been planted with representatives of some of the Endogenous orders of plants, and has also been made the site of a Garden of annual plants. This Garden will require to be greatly extended in the beginning of October, to receive the large additions of living plants which have been collected for it, and which are now temporarily arranged in flower pots, and also for numerous new species which have very recently been obtained from several of the large Botanical Gardens of Europe in exchange for seeds issued from the Garden. As yet this Garden contains only such plants as from their small size cannot be represented among the orders in the open ground where only trees and shrubs are planted. In such an establishment as the one I have the honor to preside over, the indigenous plants of India should be fully illustrated: as yet few of them exist in the Garden except trees and shrubs. The host of annual plants and climbers of the Indian Flora are almost unknown in the Garden, while the grasses that might, and should be, in the Garden, amount to at least 900 species. The climbing plants I possess are scattered over the Garden among the orders to which they belong. These, my experience of the last 6 years shows me, can only be successfully grown in a collection by themselves. The method I propose is to form a special collection of all the scandant species, providing for each species a single Casuarina tree as its support. A Garden of Medicinal plants should also be formed, and most certainly one of all plants used for economic purposes.

I now sum up briefly the objects for which I require the remainder of the ground still in the possession of the Agri-Horticultural Society.

1.—For the completion of the Endogenous class of plants, many of the orders of which are planted on the ground restored in 1865.

2.—For the extension of the annual and herbaceous Garden formed on the adjoining land.

3.—For a collection of 250 species of gigantic climbing plants, each species to have a tree of Casuarina devoted to it.

4.—For the formation of a Garden of economic plants.

5.—For a Garden of Medicinal plants.

6.—For the natural order *Anacardiaceæ*, which, unless I obtain the land I have applied for, cannot be represented in its proper place with reference to the allied orders planted 3 years ago; for the want of this land, only a few genera of this great tropical order have been planted, the other large trees of it are still in flower pots.

In conclusion, I may state that I would not press this restoration by the Agri-Horticultural Society were it possible to carry out my scheme on the land I now possess. The whole of this land is either occupied or has been already mapped out for the orders still to plant, and even after the Agri-Horticultural Society's Garden is given over, I foresee that in a few years more I shall require to apply for the extension of the garden to the extent of several acres. Since the publication of the Catalogue of plants cultivated in the Garden up to the end of September 1864, the number of species has been increased nearly three-fold, and there is every probability that the Garden will ultimately contain 12,000 species or 6 times the number in September 1864.

I have, &c.,
(Sd.) T. ANDERSON, M. D.,
Superintendent of the Royal Botanical Garden, Calcutta

TEA CULTIVATION.

Read the following extract of a letter from a Gentleman who has been Manager of a Tea Garden for the past eight years:—

"I have been reading the extract from Mr. Gibson's letter in the Agricultural and Horticultural Society's Report, and believe all he says. A garden properly cultivated, 5 by 4, which would give 2,176 plants per acre, five years' old, giving ten flushes during the season, ought and would yield 800lbs. per acre. As one pound of tea is made from four pounds of green leaf, 3,200 lbs. of green leaf would be required to make the 800 lbs., or about 1½ lbs. from each plant, which would be as near as possible 2½ ounces each plucking, premising that ten flushes were obtained, which is nothing extraordinary.

"I have always considered that a great mistake was made in opening up large areas without having sufficient labor to cultivate highly, and hope that Mr. Gibson's opinions will be adopted by you."

In connection with the above, the Secretary submitted a letter from Messrs. W. Moran & Co., Secretaries of the Central Tea Cachar Company, stating that the white ants had attacked the plants on a portion of one of their Gardens, and requesting to be informed of the best means of destroying them.

The Secretary mentioned he had recommended the application of mustard cake and constant hoeing about the plants attacked.

Read also a letter from Mons. Jacquemin, Acting French Consul, returning thanks for the information afforded to his enquiry regarding the rearing of the Silk-worm in Bengal.

Wednesday, the 14th November 1866.

S. P. GRIFFITHS, ESQ., *Vice President, in the Chair.*

The Proceedings of the September Meeting were read and confirmed.

The Gentlemen proposed at the last Meeting were elected Members, *viz*:—

Messrs. G. S. Goad; Wm. Ridge; Walter J. B. Granville, C. E.; T. H. H. Shortt, C. S.; A. Stirling; J. Deveria; Baboo Radharomun Dutt; Manager, East India Tea Company, Cachar; Messrs. H. H. Locke; Geo. Brown Smith; S. N. Smellie; A. G. Grote; Thomas Hindmarsh; Anthony Edwards; T. C. Dias; T. G. Marsh; H. Freeman; A. Badger; A. J. Sturmer; C. J. Pittar; Wm. Wright; and Baboo Nobeen Chunder Nag.

The names of the following Gentlemen were submitted as Candidates for election:—

M. H. Griffith, Esq., Merchant, Calcutta,—proposed by Mr. C. E. Cresswell, seconded by Mr. J. A. Crawford.

The Rev. T. L. J. Warneford, Port Blair,—proposed by Mr. Samuel Jennings seconded by the Secretary.

J. A. Hopkins, Esq., c. s., Raneegunge,—proposed by the Secretary, seconded by Mr. S. P. Griffiths.

Malchus Agabeg, Esq., Advocate, Rangoon,—proposed by Mr. Joseph Agabeg, seconded by Baboo P. C. Mittra.

J. M. Berrill, Esq., District Superintendent of Police, Chandwarrah,—proposed by Major J. Ashburner, seconded by the Secretary.

Col. Charles Holroyd, Assam,—proposed by Mr. S. Jennings, seconded by Mr. Griffiths.

The Hon'ble W. Markby, Judge of the High Court,—proposed by Mr. J. F. Ogilvy, seconded by Mr. Geo. Ruxton.

Dr. A. Fitzpatrick, Calcutta,—proposed by Mr. Grote, seconded by Mr. Griffiths.

G. T. Snead, Esq., Merchant, Calcutta,—proposed by Mr. Griffiths, seconded by Mr. J. G. Meugens.

W. Heysham, Esq., Deputy Collector, 24-Pergunnahs,—proposed by Baboo P. C. Mittra, seconded by Mr. Agabeg.

H. B. Barnes, Esq., Superintending Engineer, P. & O. Company's Service,—proposed by Dr. Wm. Cowan, seconded by the Secretary.

D. Farquharson, Esq., Banalee, Raneegunge,—proposed by Mr. A. S. Sawers, seconded by Mr. W. Stalkartt.

F. Barrow, Esq., Solicitor, Calcutta,—proposed by Mr. Griffiths, seconded by Mr. Meugens.

The following contributions were announced :—

1. Index to Aitchison's Treaties, Engagements, and Sunnuds,—by the Government of India.

2. Journal of the Asiatic Society of Bengal, Part 1, No. 111, 1866,—by the Society.

3. A small quantity of acclimatized Vegetable and Flower seeds, raised in the Garden of the A. and H. Society of the Punjab,—by Dr. George Henderson, Secretary of the Society.

This seed is sent with the view of testing the produce in the Society's Garden. It has been transferred to the Gardener for this purpose.

4. A Box of Egyptian broad Beans, the staple food of the ryots, and all kinds of animals,—by J. A. Crawford, Esq.

5. A large assortment of Annual Flower seeds, from Lucknow,—by Mr. Hodge.

6. Samples of Paddy raised from Acclimatized and Imported Carolina stock, at Dum Dum,—by Joseph Agabeg, Esq.

7. Samples as above, raised at Alipore,—by A. Grote, Esq.

8. Samples as above, raised in the Soonderbunds,—by C. E. Blechynden, Esq.

(Further particulars regarding this Paddy, will be found in the body of the Proceedings.)

9. A sample of Cotton, apparently from acclimatized New Orleans stock, raised at Cawnpore, and cleaned by Carver's Saw Gin,—by F. Halsey, Esq.

Mr. Halsey promises to send full particulars respecting this cultivation in due course; in the meantime he is desirous for a report on the quality and value of this small sample, which has been cleaned by the Saw Gin placed at his disposal by the Society.

The Secretary read the following report obligingly furnished by Messrs. W. Moran & Co.:—

"The sample of Cotton you have sent is very fine, free from dirt or stains, and the staple is exceedingly good. It is difficult to fix a market value for it here, as Cotton of that quality is never seen in the Calcutta market. Fair Bengal is now selling at about Rs. 21, and your sample represents Cotton as good as Fair Dhollera, which is worth in England about the equivalent of Rs. 32 per Bazar maund here."

10. Two samples of Cotton raised at Myan-Oung, in British Burmah, from New Orleans Seed,—by the Government of India.

The following is a report by Messrs. Mosley and Hurst, Honorary Secretaries, Manchester Cotton Supply Association, on this Cotton:—

"No. 2.—The produce of Myon-Oung New Orleans seed grown at Myon-Oung, has much degenerated from original stock; staple rather irregular in length; color not at all good, and badly cleaned. Home value at 9*d.* per lb.

"No. 4.—Produce of Lucknow New Orleans seed grown at Myon-Oung, is also much degenerated, but of rather better staple and color than above. Home value about 10*d.* per lb., not equal to ordinary New Orleans, for which our last quotation is 11¼*d.* on the 6th July. We return the specimens of Cotton as requested, retaining a small portion for transmission to the Cotton Supply Association."

COTTON-CLEANING ROLLER GIN.

The Secretary submitted the following communication which he had just received from Mr. George Macdonald, who had been previously in correspondence with the Society on the subject of Cotton-cleaning Machinery during the years 1862 and 1863:—

"Believing that it would be interesting to your Association to know what has been done in England with the Cotton-cleaning Machine which I submitted to your Society in 1863, and which had been favourably reported on by your Cotton Committee, [See Journal Vol. XIII., page 17, of Proceedings of the Society,] I submit the following Memo:—

"On my arrival in England, I found that it had been arranged by Dr. Forbes Watson of the India Museum to hold at Manchester a competitive trial of Cotton Gins with various classes of Cotton from India and other countries, and on this account I deferred doing anything with my Machine until I had it tried with other Machines in England, and thus ascertain its comparative value with other Gins.

"I applied to Dr. Forbes Watson for samples of the Seed Cotton to be used at the trial in order that I might adjust the Machine to such work, and see for myself if there were any difference in the result of working the Machine in England as compared with its working capacity in this country. I had the Machine driven by two men and fed by myself, and after a careful trial with seven bags of Seed Cotton, which Dr. Forbes Watson kindly sent me, of Indian, Egyptian, and Pernambuco Cotton, the results so nearly approached those attained at the trials made by your Cotton Committee, and also trials made by myself in this country, that the difference is not worth recording.

"I returned the cleaned Cotton and the seed to Dr. Forbes Watson with a memo. of the time each bag took in cleaning, and also with a request that he would say if the Cotton was ginned to his satisfaction, which he declined to do until after the trial at Manchester, which trial, however, did not take place, and I believe the idea is now abandoned altogether as it is now nearly twelve months since it was to have taken place.

"Subsequently I took the Machine to Messrs. Platt Brothers & Co., of Oldham, near Manchester, the largest Cotton Machinists in England. They approved of my Fibre Roller but did not think much of the other parts of the Machine as compared with the completeness of their own new Cotton Gin, neither was there any comparison as the sequel will show.

"We had my Machine with the Fibre Roller put under steam power and worked against their own Machine with improved leather roller and self-acting feed, and the result proved in favour of their Machine; they were, however, of opinion that if my Fibre Roller was worked in their Machine, the result would prove different and be in favour of the Fibre Roller. I complied with their desire and made a Fibre Roller for their Machine, and we put two of their forty-inch Machines to work under steam power, one with their leather roller and the other with the Fibre Roller, and the result proved in favour of the Fibre Roller, it yielding of clean Cotton at the rate of 90 (ninety) lbs. per hour, and the leather roller 68 lbs. per hour. The Cotton on this occasion was middling Egyptian, we had no other in quantity sufficient for trial. I have, however, no doubt that if we had White seed Cotton, that the result would show still more favourable to the Fibre Roller. I have given Messrs. Platt Brothers' & Co., an exclusive license to manufacture the Fibre Roller for England, India, and America.

I have written to the Firm and asked them to send you two Cotton Gins complete with Fibre Rollers and all the recent improvements; one of 40-inch for steam power, and the other 12-inch to be driven by hand. These Machines you will find very perfect and easy to adjust, and I think they will meet the approval of the Society.

I may further add, for the information of the Society, that I made during my stay in England, a very material improvement in the mode of manufacture or construction of the Fibre Roller. There is no alteration in the principle, it still being compressed fibre, but instead of attaching the compressed fibre, as before, to a wooden or metal cylinder direct, I now make the fibre into compressed rings with a metalic base to each ring; those rings are so constructed that they can be slipped on to an iron or wooden mandral or cylinder—the cylinder having a stop flange of the required height at one end—and the other end of the cylinder is provided with a cap and nut which screws on to the end of the cylinder; and thus the already compressed and finished fibre rings can be screwed up together so as to form a perfect roller or cylinder of compressed fibre, fit to be put into the Cotton-cleaning Machine, of which it forms the most vital part. This supplies a want which has long been felt by those interested in cleaning Cotton, inasmuch as the covering of the roller of the Cotton Gin is the first part to wear out; it therefore becomes necessary either to have new rollers out from England, or send the old ones back to get them re-covered. All this will now be unnecessary; those fibre rings can be sent out from England to any part of the world they being very light, and it requires no skill to unscrew the nut and remove the cap and pass the waste rings of the cylinder, and put fresh ones on so as to form a new covering to the old cylinder, or repair any damage which any part of the roller may have received."

The acknowledgments of the Meeting were tendered to Mr. Macdonald for the above communication, and his offer of the two Machines thankfully accepted.

CAROLINA PADDY.

Read the following letter from Mr. Joseph Agabeg, in reference to his trial sowings of the imported and acclimatized Carolina Paddy, received by the Society in June last, from Dr. Forbes Watson, and the Agricultural Society of Madras:—

"The Carolina Paddy you gave me, Imported and Tinevelly acclimatized, of each 2½ seers, or 5 seers in all, was sown by me in my grounds, at Fairy Hall, Dum-Dum, and I now have much pleasure in sending you specimens of both for inspection at your next Meeting.

"The plants raised from the above, were sown in the middle of July, or rather transplanted, in a spot not measuring, I believe, even half a beegah, which is a mistake as they were too near each other, and it ought to have been on one beegah, so that we could make a proper calculation what one beegah of well cultivated and well manured land in Bengal would produce. But by a guess, I think, my 7 to 8 cottahs must produce 3 *to* 4½ maunds, and as my ground was not well prepared or well manured, I think well cultivated and well manured land will produce from 14 to 16 maunds at least, and I believe this is the highest and largest production any soil in Bengal has given from the ordinary or indigenous country Paddy.

"The Imported Carolina has not grown so tall as the Madras acclimatized, but the grain, I think, larger and, perhaps, the Paddy if made *Oosna,* (boiled) will be a very superior Rice. It has one advantage over the other, and that is, when in heavy rain, or in bad weather, when blowing very hard—as on the 24th October—it does not tumble down like our country Paddy or even the Madras acclimated, which was affected by the violence of the wind on that day, though not half so much as the ordinary Paddy of Bengal, (of which kind I have sown several descriptions this year for trial). The reason is, I believe, that the Carolina, in proportion to thickness of stalk, is very short, and safer in consequence, when it gets ripe and the top gets heavy, especially in an October gale or heavy rain at the close of the rainy season. There is another advantage in the imported Carolina, and that is, that it takes much less time to grow than the Country or even Madras acclimated; and I believe it will answer for both crops the *Ouse* and *Kartick*—August and October. I would strongly recommend our Society importing in 1867, to arrive here in April, at least 100 maunds, not to be distributed to Members freely, but sold to them or given to them at cost price."

Resolved.—That a request be made, by next Mail, to Dr. Watson to procure one ton of this Paddy for more extended trial next season, and that it be distributed to Members at prime cost, due notice of the same being immediately given by Advertisement.

COMMUNICATIONS ON VARIOUS SUBJECTS.

Letters were also read:—

From John Powell, Esq., of Rosa, near Shajehanpore, on the subject of Cotton culture, of which the following is an extract:—

" My report on N. O. Cotton grown on the forest land will not be so favourable as I expected when it was in full bloom. The moth or beetle, which produces the caterpillar, came in numbers, and before long all the leaves were curled up each having a caterpillar within; the leaves soon dried up and the plants lost strength,—so that the embryo pods came to nothing; since then the plants have recovered again but the prospect of a paying crop is gone. At Rosa, however, the crop is good, some of the trees being so laden that the branches hang over and trail on the ground.

This is the second year in which the worms have done so much harm in the forest land. We have had however very few of the little pink insect, in fact I have not seen so few during any previous season.

Can you tell me what is done in America to keep off these caterpillars, and what do you recommend?

Wood ash has a good effect, I think, and I will use it freely next year.

I feel sure that I will succeed eventually with N. O. Cotton in our forest land at Oudh, because I succeed at Rosa, but this caterpillar plague must be first got rid of.

The same caterpillar attacks rose trees, and seems most to multiply when the wind has been easterly for a week or more.

I do not think that Cotton (N. O.) deteriorates here, for the pods at Rosa are large; all my experience shows that the plant requres, or is best with, a partial shade for some portion of the day, not with overlapping trees, but trees forming boundaries to fields."

From David G. Morgan, Esq., dated October 11th, submitting a recipe for destroying white ants.—"Having observed in the *Indian Daily News*, of 9th October,"—writes Mr. Morgan,—"that enquiry was made as to the best mode of destroying white ants, I beg to call your attention to the following method which was found very efficacious in plantations of Sugar Canes:—

Take a small quantity of arsenic and mix it up with a few ounces of burnt and pulverised ship's bread, oatmeal, flour, or ripe plantain, moistened with molasses. Place the size of a turkey's egg of this componnd on a flat board covered with a wooden bowl, and put these in several parts of the Plantation. The ants will soon take possession of these wooden vessels and the poison will have a general effect; for those ants that die being always eaten by the others, the whole of the estate will be effectually cleared of white ants."

From J. P. Langlois, Esq., of Goramara Tea Garden, Chittagong, on the same subject:—

"I have observed in one of the Meeting Reports of the Society, a communication from Messrs. Wm. Moran & Co., requesting to be informed of a preventive against white ants—Tea plants on one of the Cachar Gardens having been attacked by them. I can state from my experience at Akyab, where white ants are very numerous and destructive, that manuring the plants with lime, just before the rains set in, and at the beginning of the cold weather, will scare away the white ants from the immediate vicinity of the plants so manured. I have had no occasion to try lime as a preventive against white ants for the Tea plants, but as it succeeded with other plants, I have no doubt that Messrs. Wm. Moran & Co. will find it a good preventive on their Garden. Any other information on the subject, if needed, I will be most happy to supply."

From T. T. Allen, Esq., Tipperah, asking for a specific against the attacks of a certain description of insect on Carolina Paddy. The following is extract of Mr. Allen's letter:—

"A few months ago Mr. Robinson sent me some American Rice which I planted out. Up to the present it has grown exceedingly well and promised a splendid crop. But I have just discoverd that the flowers, with the growing seed forming in them, have been attacked by a sort of insect called the *mewa*. It is an insect well known by the natives with an offensive smell, and destroys the head of flowers by apparently sucking up the milky juices through its long proboscis. The head then withers away. As soon as the grain has a little hardened it appears to escape. I fear the loss of the whole crop unless I can find some means of checking the ravages of this insect. The natives tell me that charms and spells are the only remedy; that any of their crops ripening at this season are invariably destroyed by this insect. If you know of any means of getting rid of it I shall feel very much obliged by your directing me. I have taken much trouble with this Rice and it is vexing to lose it in this way."

The Secretary mentioned he had sent Mr. Allen the following recipe with which he had been furnished by Mr. C. E. Blechynden, who had found it efficacious in destroying this bug :—

"Place two or three dry cow-dung fires windward of the field, and have them fed from time to time with dry leaf tobacco, assafœdita, and sulphur. A few days of fumigation will drive the insects away."

From Messrs. Apcar & Co., enclosing invoice of a box of China silk Worms' eggs, which they have kindly procured, free of all contingent charges, on the requisition of the Society.

Resolved—That the best thanks of the Society be given to Messrs. Apcar & Co. for their kindness, and that the eggs be advertized for distribution at prime cost.

Wednesday, the 19*th December* 1866.

A. Grote, Esq., *President, in the Chair.*

The Proceedings of the November Meeting were read and confirmed.

The Gentlemen proposed at the last Meeting were elected Members, *viz :*—

Messrs. M. H. Griffith, J. A. Hopkins, C. S., Malchus Agabeg, J. M. Berrill, the Rev. T. L. J. Warneford, Col. Charles Holroyd, the Hon'ble W. Markby, Dr. A. Fitzpatrick, Messrs. G. T. Snead, W. Heysham, H. B. Barnes, D. Farquharson, and T. Barrow.

The names of the following Gentlemen were submitted as Candidates for election :—

J. Pitt Kennedy, Esq., Barrister-at-Law,—proposed by Mr. Archibald Rogers, seconded by the Secretary.

Thornton Warner, Esq., Emigration Agent for Trinidad,—proposed by Capt. C. Burbank, seconded by the Secretary.

Baboo Callycoomar Roy, Zemindar, Norail, Jessore,—proposed by Mr. R. F. Stevens, seconded by Baboo Peary Chand Mittra.

Archibald Hyslop, Esq., Merchant, Bimlipatam,—proposed by Dr. J. B. Barry, seconded by the Secretary.

Mr. Wm. Walter Floyd, Alipore,—proposed by the Secretary, seconded by Mr. Joseph Agabeg.

Dr. Joseph Dinwiddie, Civil Surgeon, Shillong and Cosya,—proposed by Mr. Archibald C. Campbell, seconded by the Secretary.

V. H. Haldane, Esq., Deputy Chairman, Municipality of the 24-Pergunnahs,—proposed by Mr. Joseph Agabeg, seconded by Baboo P. C. Mittra.

The following contributions were announced :—

1.—Memoirs of the Geological Survey of India, Vol. V, Part 3,—from Dr. Oldham.

2.—Annual Report on the Administration of the Bengal Presidency for 1865-66,—from the Government of Bengal.

3.—Journal of the Asiatic Society of Bengal, Part 2, No. 2; and Part 2, 1866, Special Number,—from the Society.

4.—A few plants of *Caladium*, *Cypripedium*, and *Vanda cerulea*,—from S. Jennings, Esq.

5.—A few *Nepenthes*———, *Lycopodium* and *Dacrydium*,—from G. M. Zorab, Esq.

6.—A few bulbs of *Lilium auratum* from Japan,—from H. Krauss, Esq.

7.—A few Potatoes of a fine kind raised at Simla,—from J. A. Crawford, Esq., on behalf of Mr. J. H. Linton.

8.—A collection (26 varieties) of seeds from Simla and its neighbourhood, —from Dr. H. Cleghorn.

9.—A small collection of fresh seeds of annuals from the Cinchona Garden at Rung-Young, near Darjeeling,—from Dr. Thomas Anderson.

10.—A quantity of Teak seed from trees in the Garden of Fairy Hall, Dum-Dum,—from Joseph Agabeg, Esq.

"Some of my trees," observes Mr. Agabeg, "are 30 to 40 years old, and full grown, the timber of the best description, dark color and close grain, and not of the soft wood and light yellow color, which does not stand half so well as the dark colored Teak."

11.—Specimens of Paddy, Rice, and Straw raised at Dum-Dum from imported and acclimatized seed,—from Major E. Wintle, Cantonment Magistrate.

(Further particulars regarding this Paddy will be found in the body of the Proceedings.)

The Gardener submitted a supplementary report on Carter & Co.'s annual flower seeds, altogether unsatisfactory. Mr. Errington states, he has also found his own acclimatized seed, and that received from Lucknow, to have generally failed this season.

Mr. W. Stalkartt observed, that he had found *late* sowings of Carter's seed succeed well, whilst *early* sowings generally failed: and he thought it probable that it was to the time of sowing rather than to any inherent defect in the seed, that the failure was to be attributed as respects trials in lower Bengal.

The Secretary mentioned that he had already received several complaints this year regarding these seeds, whilst the vegetable seeds supplied by Carter at the same time had been more favorably reported on.

It was agreed, with reference to Mr. Stalkartt's remarks, to invite report from Members in the Upper-Provinces, before communicating fully on the subject to Messrs. Carter & Co.

The Gardener reported that he had ready for distribution, among other plants, a good stock of Lichee and Sapota grafts, the latter from 3 to 4 feet in height. also the Ootacamund *Hibiscus*, and *Podocarpus Chinensis*. A supply of seedling annuals (*Phlox*, *Dianthus*, Hollyhock, Larkspur, &c.,) could also be had by early applications; a good supply of seed of *Poinciana regia* was also available.

A fine specimen of *Vanda cerulea* in full bloom was also placed on the table from the Society's Garden, and a basket of *Dendrobium nobile*, partly in flower and partly in bud, from Mr. Samuel Jennings' Garden. One of the flowers of the *Vanda* had been artificially fecundated. Some discussion ensued on the possibility of propagating orchids by seed, in the course of which Mr. Jennings mentioned, that Messrs. Veitch & Co. had introduced several Hybrid Cattleyas, (*Devoniensis*, *hybrida*, *Oxoniense* and *quincolor*) which would seem to indicate that it was possible to raise this interesting class of plants by seed.

REMARKS UPON STONE FRUIT TREES.

Some remarks by the Rev. T. C. Ferminger of Gowhatty, on a method of operating upon stone fruit trees, whereby it is said that the stone becomes much reduced in size, and in some cases totally obliterated, were next read. (See body of the Journal).

EXPERIMENTAL CULTIVATION OF CAROLINA PADDY AT DUM-DUM.

The Secretary read the following interesting report from Major Wintle, on the sowings of Carolina Paddy from seed received from the Society in June last. The acclimatized seed was furnished in June by the Agricultural Society of Madras, and the imported by Dr. Forbes Watson, of the India Museum. (See body of the Journal).

Resolved—That the best thanks of the Society be given to Major Wintle for his report, and that a copy be sent to Dr. Watson, and the Agricultural Society of Madras, with an application to the latter for another supply of acclimatized seed. The Secretary reported that, as determined at the last Monthly Meeting, he had addressed Dr. Watson for a larger supply (one ton) of imported seed, for which, in response to the advertisement, he had already received many applications.

TEA GARDENS AT RAWUL PINDEE.

The following notes by Mr. H. Cope, in continuation of those laid before the May Meeting, were next submitted:—

"In a previous communication I mentioned to you the somewhat unsatisfactory condition of the Tea Nurseries on the sub-montane portion of the District of Rawul Pindee. On my downward trip from Murree, in the beginning of October last, I again visited two of these plantations, and am sorry to say, they exhibited no signs of improvement. In the Tret Nursery, at an elevation of 3,200 feet above the level of the sea, the no longer "young" plants, though protected from the heat of the sun by grass during the summer, with an evidently adequate supply of water, and the advantage of a good slope on which no water could lie, did not seem to me to have made the slightest progress in upward or side growth. They were, in fact, in almost exactly the same unsatisfactory condition as when I saw them in April, and I very much doubt whether any change in the mode of cultivation would advantage them in the slightest degree.

At Chuttur, about 600 feet lower, the case is different, and though the plants had made no material progress as to size, they looked of a healthy green color, wanting in those at Tret. I am, moreover, of opinion, that were high cultivation adopted here, the soil deeply trenched, rock drainage established at short distances at a depth of from two to two and-a-half feet, and a good proportion of lime added to the soil, the result would be satisfactory. There are three Nurseries at Chuttur, I believe, two of them carried on, on behalf of Government, and the third in a large garden under the charge of the District authorities, in which fruits &c., are cultivated, for the use of the residents at Murree. It is very true that the cultivation of Tea in this Province, is, for several reasons, not so promising as it was, and that Indian Teas generally, are not selling so well in England as they used to do, but I believe the depression is only temporary, and that Government should not relax in their endeavours to show the Investing Public that the cultivation of Tea can be advantageously extended beyond the Valley of Kangra. The material difficulty is in the matter of land, of which very little is available in the Hill Districts west of the Jhelum."

Dr. Cleghorn exhibited to the Meeting drawings of cones of the different species of the Pines found in the North-west Himalaya, *viz* :—

Pinus longifolia.	*Cedrus Deodara.*
„ *excelsa.*	*Abies Smithiana.*
„ *Gerardiana.*	*Picea Webbiana.*

and mentioned that (assisted by Dr. J. L. Stewart) he had prepared a key or *Clavis Analytica* of the essential characters of these Conifers with native names, range of elevations, &c, which might be useful to Civil Engineers, and Officers employed in the Forests, who often seek this information.

The President stated that a concise and familiar account of these trees was a *desideratum*, and that the paper would appear in the Society's Journal, the illustrations being prepared at the School of Arts.

The best thanks of the Meeting were accorded to Dr. Cleghorn for this useful communication.

Communications were also submitted :—

1. From J. S. Douglas, Esq., enclosing a reply from Mr. Hallifax, Manager of the Dooteriah Garden at Darjeeling, to the Society's Circular, respecting the yield of leaf per acre of plants of certain ages, and at certain elevations.

2. From Joseph Agabeg, Esq., suggesting that attempts should be made to obtain Mahogany seed for distribution to Members, and others. The following is extract of Mr. Agâbeg's letter bearing on this subject :—

"I take this opportunity of requesting you to announce to the Members as well as to the public, that at present there is a great demand for Mahogany seed, and as the production of it is so small, perhaps one tree out of twenty producing seed, and it germinates so early, it would be conferring an obligation to the Society if any gentleman in the Mofussil will take the trouble to supply us, for free distribution, with seed or seedlings. Something advantageously may be done by taking notice of this want, since neither our Society's Gardens nor the Botanical Gardens of Calcutta are able to supply the present demand. Will you, therefore, bring forward this subject at your next Monthly Meeting. I dare say hundreds of old trees are in existence from the extended distributions from the Botanical Gardens, existing in many out of the way places, and perhaps in charge, or under the control of persons little knowing that such demand exists; a notice like this may therefore help our Society to meet it. Besides the intrinsic value of this wood, the tree itself is about the handsomest in India, if not in the world, and one of the greatest ornaments a garden can possess."

The Secretary intimated that he had already addressed Dr. Forbes Watson to exert his interest to obtain seed from Honduras and elsewhere.

3. From Dr. Thos. Anderson, dated 10th December, "I have for the last 18 months," writes Dr. Anderson, "sent from time to time small collections of seeds of temperate plants to be grown in the small garden, adjoining the dwelling house of the European Gardener, engaged in cultivating Cinchona, near Darjeeling. Many of these seeds have grown remarkably well, and have yielded a good crop of seed. The list of herbaceous plants in this little temperate Garden at Darjeeling, now exceed 500 species. The garden was so beautiful last spring, that Mr. Gammie, the head Gardener, of his own accord, sent me a list of the species in flower, on the 31st March, which I enclose. A considerable collection of seeds of annuals (exceeding 100 species) was made in this temperate garden in autumn, and a good number of them lately sown here have germinated well. The good quality of these seeds is so encouraging that, I hope, Government may be induced to sanction a small expenditure on the Darjeeling Garden, in order that seeds may be obtained in large quantities for distribution in September for our gardens in the plains.

If the Society will consent to publish the catalogue of all the plants growing in the Garden at Rungyoung near Darjeeling, I shall be most happy to prepare it for submission at an early date; it is short, and would occupy only a few pages of the Journal."

Dr. Anderson's offer was accepted with thanks.

4. From Wm. Forbes, Esq., Collector of Meerut. Mr. Forbes mentions that he has been applied to by the Government of Fort St. George to send seeds and plants of the "Singhara" (*Trapa bispinosa*) as they are desirous of introducing the culture of this water-nut in the Madras Presidency. As all his efforts had hitherto failed of success, he thought that probably this Society might be able to aid in meeting this commission, and he, therefore, addressed them on the subject.

The Secretary mentioned that as no dependence could be placed on seed, he had lost no time, after receipt of this application from Mr. Forbes, in sending a supply of plants per steamer "Simla," and he had little doubt, through the obliging kindness of Captain Paterson of the P. & O. Company, that they would arrive in good condition, and prove the nucleus of a plantation.

For the above communications and presentations the best thanks of the Society were accorded.

A. H. BLECHYNDEN,
Secretary.

REPORT

OF THE

Agricultural and Horticultural Society

OF INDIA.

Report from the Council to the Society at the General Meeting of the 21st January, 1867.

The Council have again, at the commencement of 1867, to submit their Report on the Proceedings of the past year.

The number of Members elected during the past twelve months (108) is of the usual average. It is satisfactory to observe that rather more than one-fourth of this number comprise persons interested in Agricultural pursuits. The proportion from the Native Community is, as usual, very limited. The distribution of the Members, as they now stand, may be referred to the following classes:—

CLASSIFICATION.	In 30 previous years.	In 1851.	In 1852.	In 1853.	In 1854.	In 1855.	In 1856	In 1857.	In 1858.	In 1859.	In 1860.	In 1861.	In 1862.	In 1863.	In 1864.	In 1865.	In 1866.	Gross Total.	Total real number at the close of 1866, after deducting lapses.
Honorary Members, ...	13	0	1	0	1	0	2	0	0	1	0	0	0	0	0	0	0	18	8
Associate Members, ...	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	3
Corresponding Members, ...	1	1	1	1	0	0	0	0	1	0	0	1	0	0	2	0	0	8	5
Civilians, ...	300	22	16	18	6	23	23	17	19	28	28	22	13	12	18	30	18	613	189
Merchants and Traders,	264	20	12	5	16	18	31	11	20	15	18	17	19	24	17	22	11	540	154
Indigo and other Tropical Agriculturists, ...	226	19	13	10	7	14	12	10	14	20	15	15	21	20	20	41	28	505	172
Military Officers, ...	212	34	18	22	19	26	22	12	14	27	38	26	25	10	21	31	9	566	143
Medical Officers, ...	97	4	5	3	4	6	9	3	3	16	11	6	7	5	7	14	5	205	56
Asiatics, ...	99	8	8	8	5	5	7	14	19	4	6	8	3	7	9	8	9	227	65
Clergy, ...	17	1	1	1	1	2	1	2	0	0	1	0	0	2	0	3	3	35	10
Law Officers, ...	51	6	3	1	3	6	2	1	5	2	1	2	4	2	3	4	8	104	30
Miscellaneous, ...	15	6	0	0	10	0	0	2	7	5	5	0	12	9	3	10	16	100	56
	1,298	122	78	69	72	100	109	72	102	118	123	97	104	91	100	163	108	2926	891

The lapses alluded to in the last column comprise 14 deaths* 54 resignations, 45 struck off, and 12 removals from the list in accordance with section 6 of chapter III of the Bye-Laws, their absence from India having exceeded four years,—making in all 125.

Of the total number (891) in the foregoing list, 30 are Life Members, 106 are absent from India, 16 are Honorary, Associate and Corresponding, leaving 739 as the number of paying Members on the books of the Society, or 26 less than last year.

Amongst those Members who have been lost to the Society by the hand of death, the Council would more especially record the names of General Francis Jenkins late Commissioner of Assam, and the Rajah Pertaup Chunder Sing, Bahadoor, an extensive Zemindar. A resolution expressive of their merits was unanimously adopted at the monthly meeting in September last; and it only remains for the Council, in this place, again to deplore the loss of two Members who in their different spheres and different places aided materially and in various ways, to the best of their ability, in promoting the objects of the Society.

The financial condition of the Society next claims notice. As apprehended in the last report, the Council have been obliged to write off, as irrecoverable, the comparatively large sum of Rupees 5066. This amount, it should be added, is made up partly of arrears of subscription, of which the recovery is hopeless, partly of subscription debited to Members after they had left the country, and which, consequently, they are not called on to pay, and partly for subscriptions due by others whose residence cannot be traced. Notwithstanding the withdrawal of this large amount, the arrears on the 31st December exhibit the sum of Rs. 11,159 of which Rs. 1,274 are due from town Members, and Rs. 9,885 from residents in the country. The sum from the former being made up principally of small arrears not exceeding 12 months, and many of one or two quarters only, it is probable the greater portion will be realized during the current year; but a loss will, it is to be feared, have to be again shown at the close of the year from the larger amount of arrears. This want of punctuality is by no means justifiable, considering the present facilities of remitting small sums from various stations in the Moffusil to the Presidency. The Council would urge this fact upon those who, while desirous of availing themselves of their privileges, apparently forget their pecuniary obligations to the Society.

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* Messrs. H. W. Cooke, J. H. Davies, George Smith, C. W. Mackenzie; Dr. H. Halleur; Lieutt. R. Stamforth; Rajah Pertaup Chunder Sing Bahadoor; Dr. R Banburry; Messrs. Thomas. J. Turner, F. A Tilton, John Bean; General Francis Jenkins (Honorary Member) Dr. R. Riddell, (Corresponding Member) and Mr. John Floyd (Associate Member)

Allusion was made in the last Report to the unsuccessful endeavours of the Society to obtain a piece of ground for the purposes of a Garden in lieu of the land which they had occupied for 30 years in the Botanic Garden, and which, on the Superintendent's application, the Government had required them to give up. It was further mentioned that an application had been made to the Government of India in the Military Department for a portion of land immediately to the rear of the Ballygunge cantonment, which had been long unoccupied. This application has also proved unsuccessful, the Viceroy having intimated his inability to accede to the Society's request. At the May meeting the Council submitted the following recommendation:—

"The Council having used their best endeavours to find a new site for the garden occupied by the Society in an eligible position, and having up to the present time been unsuccessful in their endeavours, and in consideration of the large amount of the Society's means already sunk in the cultivation of the ground adjoining the Botanical Gardens, they recommend that a further representation be made to Government to allow the Society to continne in possession of the ground at present occupied by it."

To this a reply was received from the Government of Bengal, enclosing a copy of a letter from the Superintendent of the Botanic Garden, to whom this further representation was necessarily referred, to the effect that the Lieutenant Governor was unable to allow the Society to retain possession of the ground in question. More than one offer of land has been made to the Society during the year but the Council considering the sites to be ineligible have not taken further action regarding them.

Dr. Anderson has again recently addressed the Society requesting the evacuation of the portion of the ground still occupied by them, and expressing his readiness to do all in his power in the distribution of plants to Members, so as to lessen the inconvenience and loss this resumption will naturally entail, till such time as the Society may be able to rent or purchase a piece of land on which to form a new nursery garden. The Council have resolved to avail themselves of this offer, for the temporary convenience of Members, and the necessary steps must be shortly taken to meet the orders of Government.

Notwithstanding the damage caused by the cyclone in 1864, the distribution during the past year has been steady, exceeding that of 1865. Upwards of 170 applications have been met, and the aggregate quantity of plants has amounted to 11,671 in which is included 2,670 fruit grafts and 9,001 ornamental plants. Of this quantity 3,215 has been disposed of to Members in the country. Eight Wardian cases and several open boxes have also been sent out. In consequence of the great demand for Rose plants the Council imported large collections last year from Mr. Paul of Waltham cross and Messrs. Vilmorin Andreaux and Co., of Paris, with the view of increasing the quantity and varieties of this favorite plant. The result has been altogether unsatisfactory. Nearly one half from each collection arrived in a dead state and, so great was the mortality during the hot season that a portion only of the other moiety has been secured, not more than sufficient for stock from which to propagate for distribution during 1867.

The Society is indebted to Messrs Samuel Jennings, George Livesay, George Bartlett and others for contributions of plants to the garden.

The large annual importation of seeds has been only partially successful. The vegetable seeds from America have afforded satisfaction and those from England have proved partially good. The flower seeds have unfortunately been much complained of, though every packet was placed in tin in England, previous to despatch, to avoid exposure to the damp climate of Bengal. Reports on these seeds from the Lower Provinces are unfavorable, but those from Upper India are of a mixed character, some Members stating that a portion only has succeeded whilst a few others speak highly of their germination. From these conflicting accounts it is to be inferred that many of the kinds while suitable for the climate of the Punjab and upper parts of the country, are not adapted for the Lower Provinces. The list has been revised with the view of ascertaining if the growth of certain other kinds of seeds will prove more successful. The consignment of field seeds from Melbourne has been much sought for and widely distributed.

The annual Horticultural Exhibition was held in the Sailors Play ground on the 27th January. Though not quite equal to that of 1865, it was altogether a fair show. The Prizes awarded amount to Rs. 468.

The subject of Tea cultivation has engaged considerable attention during the year and several interesting papers have been submitted. With the view of endeavouring to ascertain what has hitherto been a much discussed but unsettled point, namely the average yield of Tea per acre in the principal Tea districts of India, the Society have issued a circular for information as to the yield from plants of different ages, the results of the actual experience of planting in the different districts. Though this circular has not been so fully responded to as could be wished some useful particulars have been obtained which will shortly be prepared in a tabulated form and printed for general information. In the course of the enquiry some discussion has arisen in respect to the advantage or otherwise of planting several shrubs together in the Himalayan districts as opposed to the mode adopted in Assam and Cachar of planting single shrubs at certain distances apart. The results obtainable from the two systems cannot be fully ascertained for some time to come, not for three or four years hence.

Allusion was made in the last Report to certain varieties of *Bombyx Mori* from Japan, which are stated to yield a superior silk to the monthly worm of Bengal, and that steps had been taken for procuring eggs for trial here. The various communications which have been submitted during the last year, more especially at the monthly Meetings in March, May, June and July, show the result of such importation. The full report by Mr. Lagarde of his trials at Berhampore is particularly interesting, as also the shorter notice from Mr. Turnbull of Ghotal, who considers the silk raised from this stock as infinitely superior to the general run of Radanagore silk, and not far short of Italian. In consequence of this favourable result, a further supply of eggs was ordered and has been recently received.

The reintroduction of Carolina Paddy in Bengal has likewise engaged some care and attention during the latter part of the past year consequent on the receipt of a small quantity of acclimatised seed applied for from the Madras Government, and the simultaneous arrival of some imported seed from Dr. Forbes Watson, of the East India Museum. This seed was distributed in small packets to 15 applicants and the result in the instances reported has been so satisfactory that a much larger supply has been indented for, both of the imported and acclimatised stock, for distribution during 1867. The report from Major Wintle, Cantonment Magistrate at Dum Dum, is very encouraging, and there is every reason to hope that with ordinary care this superior description of Paddy may take root in Lower Bengal and become eventually an export article.

Nor has the important subject of cotton and cotton cleaning been overlooked; some useful information as to the relative merits of the saw and roller gins have been communicated by Messrs. Roghé, Bayes and Macdonald, and embodied in the proceedings for March and November. The Council have also forwarded to Mr. Halsey, at Cawnpore, the large Carver's Prize Sawgin which has been for many years in the Museum. Mr. Halsey has promised to communicate, in due course, full results of his trials with this large Machine on the shorter staple varieties.

In addition to other communications and specimens from various parts of the country, some interesting results have been obtained from hybridized seed forwarded from England by Major Trevor Clarke of Daventry. One specimen raised in Calcutta from a cross between Sea Island and Egyptian was valued in London in March last at three shillings a pound. Several other specimens raised from this and other crosses in the Society's garden have been forwarded to Manchester for valuation and report. It is reasonable to suppose that with special care and attention in selecting seed from the largest pods the character of such hybridized stock could be retained and would prove most valuable. There are various localities in Lower Bengal, especially in the Soonderbuns, exceedingly well adapted for the culture of the Sea Island and Egyptian varieties. Indeed, it may be here observed, that cotton recently raised there from Sea Island seed has been pronounced fully equal to the growth of South Carolina. But, however well-adapted the climate and soil of the Soonderbuns may be for the production of these more valuable varieties, they are liable to deterioration unless great care in selection of seed be adopted. Instances are not uncommon of a change in two or three generations from the long staple black seeded to the short staple green seeded varieties when their culture has been attempted in a perfectly uncongenial soil and climate. The history of "Hallett's Pedigree wheat" is a notable instance of what favorable results may be obtained by extreme care in selection of seed, but there is no security against this fine variety working back to an inferior type unless the same care in selection be continued hereafter.

Other subjects connected with Fibres; the flowering of the Bamboo in certain districts of Bengal; the growth of Cereals from Australian seed; Potatoes from New Zealand; Sheep from China &c., have come before the Society during the past year: but as particulars respecting these will be found in the proceedings it is unnecessary to enter into detail here. Sir Rutherford Alcock, the British Minister at Pekin, has promised his assistance in respect to a peculiar breed of Sheep which it is thought might be advantageously introduced in certain parts of India.

Two numbers of the Journal, parts 2 and 3 of vol. XIV, have been issued during the year, and part 4, completing this volume, is now in the press.

Statement of Receipts and Disbursements of the Agricultural and Horticultural Society of India from 1st January to 31st December 1866.

RECEIPTS.

From Members, subscriptions collected during the year, ...				22,261	0	7
,, Government Annual Donation, ...				5,000	0	0
,, Accruings of Interest on Government Securities,.. ..				665	5	4
,, Inspector General of Jails L. P. on account of Messrs James Carter and Co., for a consignment of English Vegetable seeds for Jail Gardens, ...	881	7	0			
,, R. W. King Esq., balance of account for Potatoes for the Darjeeling Municipality, ordered from Australia, ...	250	0	0			
,, Proceeds of Australian Potatoes, ...	53	0	0			
				1,184	7	0
,, Ditto of Flower Bulbs received from England,	280	0	0			
,, Ditto of melted gold originally a Gold Medal stolen by Baneemadhub Banerjee, Writer, on the 19th May 1864, ...	119	0	0			
,, Ditto of Fruit Grafts from the Nursery Garden, ...	927	2	6			
,, Ditto of a portion of surplus stock of English, French and American vegetable, and English flower seeds, and acclimatized flower seeds, ...	1,384	0	0			
,, Ditto of copies of publications of the Society	157	6	0			
,, Members, amount for glazed cases, pots and packing charges for seeds &c., ...	844	7	9			
,, Ditto, amount repaid for freight on boxes of seeds forwarded in 1865-66, ...	228	13	0			
,, Sundry receipts by sale of casks, boxes, silk worm's eggs &c., ...	45	7	3			
				3,986	4	6
Total Receipts Rupees,				33,097	1	5
" Balance in the Bank of Bengal on 31st December 1865, ...	538	8	5			
,, Ditto in the hands of the Secretary on 31st December 1865, ...	40	6	5			
				578	14	10
Grand Total Rupees,				33,676	0	3

DISBURSEMENTS.

By Messrs. James Carter & Co. for seeds supplied in 1864, ...	9,347	6	6
,, Messrs. James Carter & Co. for seeds supplied in 1865 and 66 for Jail Gardens, ..	1,153	8	7
,, Messrs. Law Somner & Co. in full of their bill for Agricultural seeds supplied in 1866, ...	480	11	9
Carried over Rs., ..	10,981	10	10

Brought forward, ..	10,981	10	10			
By Messrs Vilmorin Andrieux & Co. for Rose plants, ...	373	6	9	11,355	1	7
LIBRARY.						
„ Books purchased for the Library, ...	806	4	3			
„ Binding Books, ...	15	8	0	821	12	3
PRINTING.						
„ Sundry parties for printing receipts, letters of call and schedule of prizes for flower shows &c.	..		..	88	4	0
JOURNAL.						
„ Bishop's College Press for printing &c. 700 copies of Journal Part 2 Vol. XIV and 700 copies of Supplementary No. of Journal Vol. XIV.	646	1	6			
„ City Press for printing 700 copies of monthly Proceedings from July 1865 to June 1866,	171	11	0	817	12	6
DUTY.						
„ Collector of Govt. Customs, for duty on 2 casks of bell glasses, ...	..		..	3	5	0
NURSERY GARDEN.						
„ Ordinary expences incurred on account of the Nursery Garden from 1st. December 1865 to 30th November 1866, ...	4,357	9	6			
„ Extra expences incurred for purchase of Fruit seedlings for grafting, for glazed cases, pots and soorkee for walks &c. ..	1,080	8	0			
„ C. K. Hudson Esq., for 52 baskets of Orchids from Cherra Poonjee, ...	71	0	0			
„ Howrah Municipality for Assessment on Society's Garden from November 1864 to April 1866, ...	255	0	0	5,764	1	6
ESTABLISHMENT.						
„ Amount for Establishment from 1st December 1865 to 30th November 1866, ...	..		..	9,075	7	3
ADVERTISEMENT.						
„ Advertising notices of General Meetings, of shows of vegetables and flowers, distribution of seeds &c.	..		..	258	8	0
FREIGHT.						
„ Freight on boxes of seeds, books &c. sent and received from America, England and Melbourne, ...	..		..	485	6	3
PECUNIARY REWARDS.						
„ Prizes to Mallees for Vegetables and Fruits at Exhibition held on 27th January 1866,	285	0	0			
„ Do. do. for Flowers at do. do. on 27th do. ..	183	0	0	468	0	0
FURNITURE.						
„ Sundry articles of Furniture, ...	..		..	35	15	3
Carried over Rs., ..				29,173	9	

Brought forward, ..	..			29,173	9	7
METCALFE HALL.						
By Society's proportion of Assessment on the Metcalfe Hall from October 1865 to September 1866, ...	360	0	0			
„ Do. do. for Lighting Tax from do. to do. ..	72	0	0			
„ Messrs. Burn & Co. in part for repairs in 1865 to N. Portico of Metcalfe Hall	1,000	0	0			
„ Do. for 17 pieces of Granite Stones for North and West Gate and for sundry other petty repairs, ...	127	2	9	1,559	2	9
STATIONERY.						
„ Stationery for office books &c.	68	1	0			
„ Brown packing paper for packing seeds, ..	60	0	0	128	1	0
SILKWORM'S EGGS.						
„ Mr. Lotteri for commission sale for 10 boxes of Silkworm's eggs, ...	126	0	0			
„ Messrs. Apcar & Co. for a box of China Silkworm's Eggs, ...	77	4	9	203	4	9
TEA SEEDS.						
„ Bengal Tea Company for 1½ maunds of Tea seed, ...	..			37	8	0
PETTY CHARGES.						
„ Sundry charges, including postage on letters &c. sent and received and for copies of the Journal, ...	625	15	11			
„ Extra writers and packermen for sub-dividing and writing on seed papers &c., for soldering tin boxes, for making wooden boxes sent to non-resident Members and for other petty charges, ...	262	12	0			
„ Mr. W. Bennett for sale of 2 copies of his Cotton Essay, ...	1	0	0			
„ Extra work and men to break through stowage and get out 24 cases of American seeds from the hold of the *Derbyshire*, ..	66	0	0			
„ Mr. Laulor for commission on realization of 56R from Preonauth Sett, ...	5	9	6			
„ Native vegetable seeds, ...	16	0	0			
„ Secretary Bank of Bengal for commission for drawing Interest on Government Securities, ...	1	10	8	979	0	1
				32,080	10	2
„ Balance in the Bank of Bengal on 31st December, 1866, ...	1,505	15	7			
„ Do. in the hands of the Secretary on do. ..	89	6	6	1,595	6	1
Grand Total, Rs. ..	..			33,676	0	3

MEMORANDUM.

Disbursements.

To amount of Disbursements during the year as per statement, ...				32,080	10	2
„ Balance in the Bank of Bengal on 31st December 1866, ...	1,505	15	7			
„ Ditto in the hands of the Secretary on 31st December 1866, ..	89	6	6			
				1,595	6	1
Total Rupees,				33,676	0	3

Liabilities.

James Carter & Co. balance of consignments of seeds for 1865 and for the whole of 1866 £ 988 8 7 say, ..	9,890	0	0			
Landreth and Son for 1865-66 $ 2,255	4,510	0	0			
Messrs. Burn & Co. balance for repairs to Northern Portico of Metcalfe Hall,	1,000	0	0			
Bishop's College Press for printing Part 3 Vol XIV, ...	395	2	6			
				15,795	2	6

Receipts.

By amount of Receipts during the year 1866 as per statement, ...				33,097	1	5
„ Balance in the Bank of Bengal on 31st December 1865, ...	538	8	5			
„ Ditto in the hands of the Secretary on 31st December 1865, ...	40	6	5			
				578	14	10
Total Rupees,				33,676	0	3

Dependencies.

Amount invested in Government Securities lodged in the Bank of Bengal, ...				16,633	5	3
Ditto of Subscription in arrear, ..	11,159	13	5			
Ditto outstanding for seeds, grafts, copies of Journal &c. &c., ...	3,211	6	6			
				14,371	3	11

LIST OF MEMBERS

OF THE

Agricultural and Horticultural Society

OF

INDIA.

DECEMBER 31*st*, 1866.

ALPHABETICALLY ARRANGED

AND

DISTINGUISHING THE YEAR OF ADMISSION.

Office Bearers.

President.

ARTHUR GROTE ESQ.

Vice-Presidents:

BABOO GOBIND CHUNDER SEN.
S. P. GRIFFITHS, ESQ.
BABOO SHIB CHUNDER DEB.
W. STALKARTT, ESQ.,

Secretary and Treasurer:

A. H. BLECHYNDEN, ESQ.

Members of Council:

J. AGABEG, ESQ.
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Smith,† Lt. Coll., E. Fleetwood,	1852
Smitn, R. H., Esq., Principal Sudder Ameen, Lucknow,	1860
Smith, Jas. Esq., Shahpore, Tirhoot,	1863
Smith, Thomas, T. Esq. Bogdamaree factory via Bogwangolah,	1864
Smith, C. M. Esq., Merchant, Calcutta,	1865
Smith, Rev. W. O'Brien, Calcutta,	1865
Smith, Rev. James, Delhi,	1866
Smith, Geo. Brown, Esq., Manager, Lacknah Tea Concern, Seebsaugore	1866
Snead, G. T. Esq., Merchant, Calcutta,	1866
Snow,† Lt. Coll. R., Deputy-Commissioner,	1862
Spankie, R. Esq., Civil service, Agra,	1865
Spearman, Lt. Horacc, Asst. Commissioner, Youngzaleen, Shoaygeen,	1865
Spears, Robert, Esq., Agriculturist, Golah Ghat, Upper Assam,	1855
Spencer, C. J., Esq., C. E., E. I. Railway, Allahabad,	1863
Squire,† Dr. John,	1860
Stack, R. F. Esq., Solicitor, Calcutta,	1862
Stalkartt, William, Esq., Merchant, Calcutta, (*Vice-President.*)	1845
Stalkartt,† J. Esq.,	1863
Stalkartt, John Esq., Indigo-planter, Setulpore Factory, Chuprah,	1861

	Admitted.
Stainforth, H. Esq., Ranchee,	1862
Stanton, Capt. F. S., (Engineers,) Calcutta,	1857
Steel, Donald, Esq., Eastern Cachar Tea Company,	1861
Steel,† Jas. Esq., Merchant,	1863
Steer,† Charles, Honble. Civil service,	1853
Stephen, J., Esq., Dacca,	1855
Stephenson, Cecil, Esq., Agent. E. I. Railway, Calcutta,	1866
Sterndale, R. A., Esq., Calcutta,	1859
Stevens, R. F. Esq., Manager Hazrapore Concern, Jessore	1866
Stevenson,*† William, Esq., Junior, M. D.,	1834
Stewart,† Capt. the Honourable, A. R., H. A.,	1862
Stewart, A. N. Esq., Collector of Tolls, Jungypoor,	1862
Stewart,† Wm. McAdam, Esq.. Merchant,	1851
Stewart, W. M. Esq., Dulsing Serái, Tirhoot,	1859
Stewart, Captain John, Depy. Com. of Ordnance, Cawnpore,	1860
Stewart, J. Esq., Indigo-planter, Tirhoot,	1863
Stewart, R. D., Esq., Merchant, Calcutta,	1863
Stewart, Dr. J. L., Offg. Conservator of Forests, Punjab,	1864
Stewart, Capt. F. G. District Supt. of Police, Nagpore,	1865
Stirling, A. Esq., Allipore,	1866
Stocks, J. W. Esq., Berhampore	1866
Stoney, R. V. Esq., Civil Engineer, Hidgelee	1866
Story, Major General, F. P., C. B., Nynee-Tal	1854
Strachey,† Lt. Col. R., (Engineers,)	1857
Stuart, Alex. Esq., Ranneegunge,	1863
Sturmer, Edwin, Esq., Asst. Engr. Canning Town, Mutla,	1863
Sturmer,† John Esq., Civil Engineer, Sonapore,	1864
Sturmer, A. J. Esq., Talooka Kojha, Viá Gazeepore	1866
Sumbonauth Pundit, Honble. Judge High Court, Calcutta,	1853
Sutherland, Charles, J., Esq., Merchant, Calcutta,	1838
Sutherland, Dr. John, Civil Surgeon, Barrackpore,	1859
Sutherland, H. C. Esq., Civil service, Burrisaul,	1860
Supt. of Jorehaut Tea Company, Assam,	1865
Supt. of the Queen's Gardens, Delhi,	1865
Supt. Northern Assam Tea Company,	1865
Supt. Jellalpore Garden, Cachar,	1865
Suttoshurn Ghosal, Rajah Bahadoor, Calcutta.	1856
Swinden, T. G., Esq., Calcutta.	1855
Swinhoe, William, Esq., Attorney, Calcutta,	1859
Syud Ahmed Ally, Nawab, Calcutta,	1864
TANNER, J. E. Esq., Delhi Railway, Loodianah,	1866
Tarruck Nauth Dutt, Calcutta,	1866
Tayler, W. Esq., Patna,	1853
Taylor, G. B. Esq., Mussooree,	1858
Taylor,† V. T. Esq., Civil service,	1860
Taylor, W. C., Esq., Cuttack	1858

	Admitted.
Taylor, D. W. Esq., Grantee, Oude,	1864
Taylor, Honble G. N. Civil service, Barrackpore,	1865
Terry, W., Esq., Indigo-planter, Midnapore,	1846
Thelwall, Major, J. B., C. B., Meean Meer,	1851
Thomas, R. M. Esq., Solicitor, Calcutta,	1849
Thompson,† Major, E., Deputy-Commissioner,	1856
Thompson, A. B. F. Esq., Merchant, Calcutta,	1861
Thompson, Lt. Col. E. Political Agent of Duttea and Chutterpore,	1864
Thompson,† Rivers, Esq., Civil Service,	1864
Thompson, Dr. R. F. Hooghly,	1865
Thompson, W. H. Esq., Civil Service, Dacca,	1866
Thomson,† Ninian Esq., Judge, S. C. Court,	1862
Thomson, Walter Esq., Merchant, Behea, Shahabad,	1862
Thomson, J. H. Esq., District Supt. of Police, Chyebassa,	1864
Thomson, Wm. Esq., Merchant. Calcutta,	1865
Todd. J. E. Esq., Tea-planter, Novcacharee factory, Jorehaut, Assam,	1862
Tonnerre, Dr. C. Fabre, Health Officer, Calcutta,	1862
Toulmin. L. W. Esq., Merchant, Calcutta,	1862
Tovey. Captn. J. T. Executive Engineer, Cawnpore,	1866
Trafford, Rev. John, Serampore,	1863
Trannath Chatterjee, Baboo, Calcutta,	1865
Tregear, Richd. Esq., Kolinjura, Jaunpore,	1866
Trevor,† Edward Tayler, Esq., Civil service,	1844
Trevor,† E. A. Esq., Royal Engineers,	1864
Tripe, A. A. Esq., Amoah Factory, Tirhoot,	1864
Tronson,† Capt. T. H.,	1862
Troup, C. J. R. Esq., Manager Kamaon and Kattywar Tea Company, Almorah.	1863
Tyler, Dr. J. W. Mynpooree,	1863
Tucker, W. T. Esq., Civil service, Bancoorah,	1855
Tulloch, Capt. A. Dist. Supt. of Police, Rungpore,	1865
Turnbull, C S., Esq , Silk Manufacturer, Ghuttal,	1853
Turnbull, J. D. Esq., Civil service, Meerut	1865
Turnbull, Robert Esq., Merchant, Calcutta,	1865
Twynam, Capt. E. J. L., Executive Officer, Thayet Myo,	1856
VEEN, W. Ter Esq., Merchant, Calcutta,	1864
Vertannes, J. C., Esq., Civil Engineer, Contai,	1865
Vincent, Major F. F., late 30th Regt. N. I. Jubbulpore,	1859
Vivian, G. W. Esq., Civil Engineer, Morshedabad,	1862
Vizianagram, His Highness the Rajah of,	1847
Vonfugger, Max, Esq., Tea-planter, Collacherra, Cachar,	1862
Voss, C. W. Esq., Merchant, Gopalpore,	1864
WEBSTER, Geo. K. Esq., Civil Service, Balasore,	1866

	Admitted.
Wagentreiber, W., Esq., Tea-planter, Debroghur,	1857
Walker,† Alexander, Esq.,	1855
Walker, G. A., Esq , Tea-planter, Chincooree Tea Gardens Cachar,	1861
Wall† P. W. Esq., C. E., S. E. Railway,	1863
Wallace, Adolphus, Esq., Rungajaun Factory, Golaghaut, Assam,	1866
Waller, Capt. H. E., District Supt. of Police, Monghyr,	1865
Walter, Capt. C. K. Political Agent, Bhurtpore,	1865
Walters,* Henry, Esq.,	1836
Ward,† J. D., Esq., Civil service,	1857
Warneford, Rev. T. L. J., Port. Blair,	1866
Waterfield, E. Esq., Civil service, Humeerpore,	1846
Watkins, Jocelyn, F. Esq., Solicitor, Calcutta,	1866
Wauchope, S. Esq., Civil service, Hooghly,	1848
Wavell, Wm. Esq., Civil service, Bograh,	1859
Webster, H. B. Esq., Civil service, Boolundshohur,	1864
Weinholt, John Esq. Merchant, Calcutta,	1859
Weinholt,† W. Esq., Merchant,	1848
Wemyss, Sir John, Bart, Mirzapore,	1859
Were, H., Esq., Station Master, Koosteah,	1863
Weskins, Charles, Esq., Merchant, Calcutta,	1854
Westmacott, E. V. Esq., C. S.,Purulia,	1865
Weston, John, Esq., Judge S. C. Court, Magoorah,	1863
Whampoa, Mr. Merchant, Singapore,	1850
Whinfield, † E. H., Esq., Civil service,	1860
White, Major, M. J. 21 N. I. Meean Meer,	1862
Whitney, W. M., Esq., Merchant,Calcutta,	1860
Wickes, Haines, Esq., Ex. Engr., Chittagong,	1866
Wight,*† Robert, Esq., M. D.,	1830
Wilkinson, Major, A. E., Cantonment Magte., Fyzabad,	1862
Williams, Fleetwood, Esq., Civil service, Meerut,	1840
Williamson, Major, James, Commandant 26th Regt. N. I., Fort William,	1849
Williamson,† George, Esq., Junior,	1860
Williams J. Esq., Meeywar Agency, Agra,	1859
Wilmot, C. W., Esq., Assist. Commissioner, Sonthal Purgunnahs, Deoghur,	1859
Wilson, A. G., Esq., Deputy-Magistrate, Burhee,	1847
Wilson, Thomas, Esq., Deputy Opium Agent, Gazeepore,	1848
Wilson, Charles Esq., Surgeon, 8th N. I. Bareilly	1860
Wilson,† C. H. Esq., Merchant,	1860
Wilson, Lt. Coll. H. M., Ghazeepore,	1860
Wilsone, C. M. Esq., Munglepore,	1858
Windle, J. A. Esq., C. E. Executive Engineer, Balasore,	1865
Wingrove, Clement, Esq., Tea-planter, Debroghur,	1865
Winson, Capt. Wm. Comg. 18 N. I. Bhaugulpore,	1865

Monthly Proceedings of the Society.

(Wednesday, the 18th January, 1865.)

A. Grote, Esq., President, *in the Chair.*

The proceedings of the last Monthly Meeting having been read and confirmed, the Members proceeded, in accordance with the Bye-Laws, to the election of Officers and Council for the current year. The President in nominating Dr. Cleghorn and Baboo Koomar Harendra Krishna as Scrutineers, trusted the voters would alter the Council's nomination lists of Office Bearers on the ballot paper as freely as they felt inclined. It was an object, he thought, to promote the frequent change of Office Bearers, and though the Council had again done him the honor of proposing him for re-election as President, he should himself like to make way for a new incumbent.

The ballot papers having been returned, the Scrutineers reported the result to be as follows:—

President.—Mr. A. Grote.

Vice-Presidents.—Baboo Peary Chand Mittra, Captain W. N. Lees, Baboo Gobind Chunder Sein and Mr. S. P. Griffiths.

Secretary.—Mr. A. H. Blechynden.

Council.—Rajah Pertap Chunder Singh, Bahadoor, Mr. W. G. Rose, Mr. J. Agabeg, Mr. C. E. Creswell, Mr. T. H. Mosley, Mr. W. Stalkartt, Mr. J. A. Crawford, Mr. A. Sawers, Dr. Thomas Anderson, Mr. W. Haworth, Mr. S. H. Robinson, and Dr. C. Fabre Tonnerre.

STANDING COMMITTEES.

The revision of the Standing Committees was next entered on, and the names of the following Members were added, where vacancies had occurred, *viz.*:—

Silk,—Mr. E. G. Buskin. *Implements of Husbandry, and Machinery,*—Captain H. Hyde, and Mr. T. H. Mosley. *Nursery Garden,*—Mr. C. E. Creswell. *Fruit and Kitchen Garden,*—Dr. Tonnerre. *Correspondence,*—Mr. J. A. Crawford.

ANNUAL REPORT.

The Secretary read the Annual Report.

The President expressed a hope that the Report would be adopted. There was only one part of it on which he wished to offer a few remarks, and that was the table which classified the Society's Members. It was with great regret that he noticed the small, and, he feared, yearly diminishing number of Native Members. These gentlemen had now 67 representatives only out of 820. He would remind the Meeting that the co-operation of the Native Landholders was of great importance to the Society's efforts on behalf of Agriculture, and he hoped that the Native Members present would exert themselves to enlist it to a greater extent. It was their class which would benefit most largely by the result of these efforts.

Baboo Joykissen Mookerjee remarked, that on being informed by the Secretary of the paucity of Native Members, he had mentioned the circumstance to several Native gentlemen in and out of Calcutta, strongly urging them to become Members of the Society. Their answer invariably was, that though the Society had certainly done some good in the Horticultural Department, not much had been done in the Agricultural line, and that Model Farms ought to be established in different parts of the country, such as Dacca, Burdwan, Moorshedabad, Patna, &c., under the auspices of the Society; and that he had tried to convince them that, with the present limited pecuniary means at the command of the Society, this could not be done, and that the best way would be for a large number of his countrymen to join the Society, and thereby enable it to carry out such proposals with increased resources. When Mr. D. J. Money was Collector of Hooghly, he established a Branch Society with the co-operation of the Native gentry. For a few years it flourished very well, but on Mr. Money's and his departure, it fell to the ground. He was decidedly of opinion, that under existing circumstances, Natives in the mofussil were not yét prepared to establish these institutions, unless materially assisted by the European community and by this Society.

Mr. William Stalkartt observed that the Native gentry should be more self-reliant. The rich Zemindars should unite, if they deemed it so necessary, for the establishment of model farms, and not always look to the European community to take the lead in matters in which they would eventually be so much more benefitted. But if they really wished the Society to take the initiative, they should place it in a position to do so, by increasing their numerical strength in due proportion to the European Members.

After a few more remarks by other Members, it was moved by Dr. Cleghorn, seconded by Mr. R. Blechynden, and resolved, that the Report of the Council be received and adopted.

The ordinary business was then proceeded with, and the following Gentlemen proposed at the last Meeting, were duly elected Members :—

Messrs. H. Beveridge, M. T. Pearson, and the Revd. J. Cole.

The names of the following Gentlemen were submitted as candidates for election :—

D. P. Skipton, Esq., Tea Planter, Gola Ghaut, Assam,—proposed by Mr. W G. Rose, seconded by Mr. R. Blechynden.

J. S. Armstrong, Esq., C. S., Cuttack,—proposed by Mr. T. W. Armstrong, seconded by the Secretary.

Kazee Ramzan Allee, Sarun,—proposed by the Hon'ble Sumboonauth Pundit, seconded by Baboo P. C. Mittra.

C. E. Phillips, Esq., Tea Planter, Darjeeling,—proposed by Mr. R. Blechynden, seconded by the Secretary.

The following contributions were announced :—

1.—Journal of the Royal Asiatic Society of Great Britain and Ireland, New Series : vol 1, part 1, presented by the Society.

2.—Report of the Government Central Museum at Bombay for 1863, (Bombay Government Records, No. 83)—presented by the Government of Bengal.

3.—Report upon the Forests of the Punjab and the Western Himalaya. By H. Cleghorn, M. D., Conservator of Forests, on special duty—presented by the Author.

4.—Journal of the Asiatic Society of Bengal. Supplementary number, vol. 33. Presented by the Society.

5.—Fifty copies of a Catalogue of Seeds collected in the Botanical Gardens, Calcutta. Forwarded by Dr. Anderson for distribution.

6.—Two samples of Cotton, with and without seed, raised from New Orleans-seed. Forwarded by R. E. Forrest, Esq., Ex. Engineer, Etawah Division, Ganges Canal.

The following is extract of Mr. Forrest's letter :—

"The Cotton was grown in the garden land of one of the Canal "chakees" here, from New Orleans-seed, obtained from Mr. Kearney, Indigo Planter, of Allygurh. It was sown on the 13th July 1864, immediately after the first fall of rain which, this year, did not take place till the 10th of July. The sowing was thus somewhat late. Mr. Henley, an Indigo Planter here, put down some of the same seed but unsuccessfully. Some of it was sown also in another of our chakee gardens, but also unsuccessfully. The want of success in both cases was due to a want of water. The Cotton, of which the specimen is forwarded, was grown in good soil, kept moist by its proximity to the Canal. The Cotton was irrigated continually. I think the success of the crop must be owing to the dampness of the soil and the command of water.

"Some Pernambuco Cotton seed was put down in one of our chakee compounds a year or two ago. The shrubs grew up to a great height and flowered freely, but no pods formed.

"I am not aware of any foreign Cotton having been successfuly raised in this district besides that now sent, and I am therefore anxious to know whether the Cotton is of a quality which would warrant running the risk and extra expense which seem to attach to its cultivation."

7.—A small sample of Cotton raised in the Soonderbunds from New Orleans-seed; received from W. C. Hannah, Esq.—"I beg to inform you," writes Mr. Hannah, "that this Cotton was raised in the Soonderbunds in lot No. 18, simply as an experiment. I had about three beegahs of land prepared, by raising it up about two feet, so as to allow the surface water to run off; this I did by making trenches about two feet deep and the same in width, and filling them up with cow manure, covering up the manure again with the soil from the next trench. I found the plants thrive very well. I am sorry, however, I cannot give you the particulars of their growth, as the register was swept away during the Cyclone, nor can I inform you from what seed it was grown; I may mention that only two pods were gathered in, and they were picked up after the water had subsided, which is much against its color."

The above samples were referred to the Committee for report.

Captain Hogg submitted for the inspection of the Members two fine Tea plants, of eleven months growth, 2 feet 9 inches in height; one raised from hybrid, and the other from indigenous (Assam) seed, in the Victoria Garden at Chittagong.

Dr. Cleghorn exhibited colored drawings of *Daphne oleoides* and *Desmodium argenteum* of Wallich, fibre-yielding plants of the Sutlej Valley and outer Himalaya. He stated that he had transmitted a small quantity of the stripped bark of the *Desmodium*, to the Valleyfield Paper Mills, near Edinburgh, where it was tested as a paper material and pronounced "very good." A specimen of the fibre prepared for the manufacture of paper was exhibited. The plant is widely distributed, and large quantities of the fibre might be obtained, but the chief obstacle to its general use is the expense of transport, as the place of production is remote from the seaboard.

Dr. Cleghorn also read an extract from a letter of Captain A. M. Lang, R. E., Superintendent of Hill Roads, regarding ropes made from this or an allied species of *Desmodium*. "The twigs are plaited together into cables as thick as a man's arm; these are soaked in a stream for a few days to make them thoroughly pliable, and then used as ropes to drag heavy logs from the forests. The enormous "Cantileners" of the Wangtoo bridge, were pulled across the torrent of the Sutlej with these ropes, when tarred English ropes snapped."

On the recommendation of the Council it was agreed, that the first Show of the season be held in the Auckland Gardens, on Friday, the 10th of February.

Letters were read:—

From James Stuart, Esq., dated Cachar, 13th January, in reference to the subject mooted at the November Meeting, respecting the cutting of the tap-root of the Tea Plant, of which the following is an extract:—

With regard to Mr. Macivor's theory, that a large return of Tea is secured by cutting off the tap-root of the Tea Plant, the only instance I have known of seedlings having been dealt with in this way was at a garden in Cachar, where the Manager in putting out his seedlings, cut-away the tap-root or a portion of it. The garden, I believe, has turned-out very well, but I have never heard that it was more successful than the average of other gardens of the same age in the province; and as the garden is only three years of age, it is difficult to say whether this process of cutting the tap-root will materially affect the yield of Tea. I have never seen the garden, nor can I positively assert that it was planted out in this way, but I have heard that such was the case. In our gardens, on the contrary, we are most careful in not having the tap-root injured in any way when the plant is being removed from the nursery beds, and I have repeatedly observed that in cases of careless lifting, when the tap-root got lacerated and broken off, the plant either died away, or suffered greatly in consequence. I am therefore of opinion, that as no decided advantage has as yet been proved to have been gained in the out-turn of Tea, by removing the tap-rot, a needless risk is incurred without any decided benefit arising from it. Proper cultivation, I am convinced, is the grand leaf-giving stimulant, and if due attention were paid to this, a much larger increase of Tea would be realized.

From Major B. Ford, Superintendant of Port Blair, applying for a quantity of Guinea Grass Seed or Roots for introduction into that Settlement.

(Request in course of compliance.)

From Secretary Agricultural Exhibition, Rajshaye, returning thanks for the offer of a Silver Medal for award at their approaching Show.

For the above contributions and communications, the thanks of the Society were accorded.

(Monday, the 20th of February, 1865.*)*

A. Grote, Esq., President, *in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The following Gentlemen were elected Members:—Messrs. D. P. Skipton, J. S. Armstrong, c. s., C. E. Phillips, and Kazee Ramzan Allee.

The names of the following Gentlemen were submitted as candidates for election:—

C. M. Smith, Esq., Merchant, Calcutta,—proposed by Mr. S. P. Griffiths, seconded by Mr. C. E. Creswell.

D. T. Shaw, Esq., Merchant, Calcutta,—proposed by Mr. Griffiths, seconded by Mr. Creswell.

Captain J. W. H. Johnstone, Assistant Commissioner, Bunnoo,—proposed by Captain H. C. Johnstone, seconded by the Secretary.

The Revd. W. O'Brien Smith,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

William Cowan, Esq., Surgeon, Eastern Bengal Railway,—proposed by Mr. Archibald Hills, seconded by the Secretary.

Captain John Paterson, Superintendent P. & O. Company,—proposed by the Secretary, seconded by Mr. Griffiths.

Mr. John Floyd, was proposed as an Associate Member, on the recommendation of the Council.

The following contributions were announced:—

1. A Collection of Treaties, Engagements—&c., Vol. VI.,—presented by the Government of Bengal.

2. A Catalogue of the Economic Products of the Bombay Presidency, by Dr. Birdwood,—presented by the Government of Bengal.

3. Report of the Bengal Chamber of Commerce, from May to October 1864, —presented by the Chamber.

4. The Annals of Indian Administration, parts 3 and 4 of Vol. VIII. —presented by the Government of Bengal.

5. A small assortment of seeds of the Hill Fir, and other seeds of British Burmah, collected by Captain W. Grove, 32nd Regiment, M. N. I. and Superintendent of Police in the Martaban District,—presented by the Chief Commissioner.

6. A few Australian seeds, presented by James Cowell, Esq.

7. Specimen of Cotton raised in the Jail Garden at Hummeepore, from acclimatized New Orleans-seed received from the Society,—presented by Dr. J. M. Fleming.

The following is the note furnished by Dr. Fleming respecting this Cotton:—

"The extent of land sown was a little short of two acres, and the soil of the kind called in the district "Kabar," a heavy brown loam, but not of quite so tenacious a nature as the black "Mar" soil, so common in Bundelkhund. The piece of ground selected, had not been under cultivation for some years previously. It was well ploughed and manured, and then thrown up into ridges about eight inches in height, and from 2½ to 4 feet apart.

"The seed was sown partly in April, and partly in the beginning of July, the time the rains usually set in. That sown in April, was irrigated until the commencement of the rains, by which time, the plants were about two and a half feet high, and in full blossom. They grew rapidly during the rains, and by the beginning of September, were about five feet in height, the pods fully formed and in great abundance. The picking was commenced in the beginning of October, and the return was very good.

"What was sown in July, was not so successful. It was purposely left without irrigation by way of experiment, as most of the land in the district does not admit of being irrigated, and as the rains were very late in setting in, and extremely scanty, (only 11-8 inches having fallen from 1st July to 30th September,) the plants did not attain their full size, and the pods produced were much smaller and fewer than in the other part of the garden. The result, however, considering the badness of the season, was on the whole satisfactory.

"It would, of course, be premature to draw any definite conclusions from the bare experience of one year, but I am inclined to think, that in so dry a climate as Bundelkhund, it would be preferable not to raise the soil in ridges, and I am not sure that it would not be advisable to sow "Joar" or "Bajra" between the rows of cotton, so as to protect the ground and the young plants from the excessive heat of the sun. As these cereals strike their roots but a very short way below the surface, and ripen before the commencement of the picking season, they would not interfere with the cotton crop. They would also serve to utilize the ground, between the cotton rows, a point of great consequence in the eyes of a native cultivator."

8 Sample of Flax, the produce of indigenous seed, prepared by Dr. Bonavia, Secretary, Agricultural and Horticultural Society of Oude,—forwarded by the Chamber of Commerce for an opinion.

The following is an extract of Dr. Bonavia's letter :—

"By direction of the Chief Commissioner of Oudh, I have despatched to your address, a box containing some Flax extracted from the native plant. Last year I got some native seed from the bazaar, and sowed it thickly and irrigated it, but it was allowed to ripen too much for the sake of the seed. Hence perhaps the coarseness of the sample I have sent you. The straw was rotted and afterwards scutched by hand with the rudest implements. I think the native Flax susceptible of great improvement, but whether it will pay any one to undertake its improvement, is quite a different question, which can only be solved by direct experiment."

(Referred to the Fibre Committee.)

The Council announced that they had elected the following Members of their body to the Committees of Finance and Papers, *viz.*

Finance. Baboo Peary Chand Mittra, Messrs. C. E. Creswell, J. A. Crawford, and W. Stalkartt.

Papers. Messrs. A. Grote, W. Haworth, J. A. Crawford, S. H. Robinson, Dr. T. Anderson, and Captain W. N. Lees.

The Council further gave notice, for disposal at the next Meeting, the following amendment to the Bye-Laws, *viz.*,

That the words, "Two of whom shall always be natives," be omitted from Section 2 of Chapter X.

HORTI-FLORICULTURAL EXHIBITION.

Read the following Report of the Judges at the Show of Vegetables, Fruits, and Flowers held in the Auckland Garden on the tenth of February :—

Horticultural.—This Show contrasted most favorably with previous Exhibitions. It may be considered as about one of the best that has been held. The collection of vegetables was excellent. The Celery, especially, which has hitherto not been equal to other kinds, was well represented on this occasion. The principal prizes were awarded to the gardeners of Amateurs. All the *Brassica* tribe shewed well. The Potatoes were very good, also Peas and Carrots. Several baskets of good Beet were placed on the stands ; among the Beans were some good specimens of the Windsor kind, to the best of which a Medal was awarded.

Though inferior to the vegetable department, there was a fair display of fruits, the principal of which consisted of Pomegranates, Sapotas, Pineapples, Guavas, and Pummelows. There was only one basket of Strawberries, to which a prize was awarded.

In the collection of indigenous vegetables, there was not much variety. Some good specimens of Tomatoes, Maize and Ginger were shewn, and a few good Sugarcanes.

About 100 gardeners were present, and prizes amounting to Rs. 274 were awarded to 50, as per list annexed.

WILLIAM G. ROSE.
PEARY CHAND MITTRA.
JOSEPH AGABEG.
CH. FABRE TONNERRE.

Floricultural. Notwithstanding the damage sustained by all the gardens in Calcutta and its vicinity, from the severe Cyclone in October last, this Show may be regarded as altogether a surprisingly fair one. The general collection was, perhaps, as large as at any previous Shows, and there were not a few interesting and well grown plants among them. The collection of Roses was contributed by ten gardens; it was not so good as on several former occasions, it being rather late in the season for this fine family; nor were there so many of the newer kinds; still there were some good specimens, especially from the gardens of Baboo Bindabun Chunder Mittra, and the Hon'ble C. Steer. There were two small but choice collections of *Begonias* from the gardens of Captain Paterson, and Rajah Shotto Shorn Ghosaul. From the former gentleman's garden some good Caladiums were also submitted. Of Orchids, the display was very poor; nor were the Bulbous tribe well represented. Of Pinks, there was a large collection, and among them some good varieties, especially from Captain Hyde's garden. The German Asters did not show in their usual abundance, but there were a few good specimens; those from Mr. E. H. Lushington's garden were particularly good. There was a tolerably large collection of *Oxalis*, the best grown being from Mr. R. F. Stack's garden. *Verbenas*, *Phloxes*, and *Portulaccas* were well represented; the best specimen of the former came from Mr. G. S. Fagans's garden. The collections of Heartsease and Violets were tolerably good. Mr. W. Stalkartt's gardener gained the first prize for the former, and Mr. Grote's gardener for the latter. *Tropœolums* shewed well, perhaps better than on any former occasion. The Balsams were also very good for the present season. Mr. A. Walker exhibited a fine *Salvia*, (new variety). Several good plants of *Olea fragrans* were placed on the stands; a few tolerably fair Camellias; and *Euphorbia Jacquiniflora.* The stocks were uncommonly good, especially those from Mr. Stack's garden. There was a great falling off in the Pelargoniums, which have usually been so well represented at this first Show of the season. Some good plants of Heliotrope were brought forward. The Ferns were few in quantity but well grown, especially those from the garden of Rajah Sutto Shorn Ghosal. From the Barrackpore Park came a nice collection of plants of variegated foliage. Messrs. Borradaile, Schiller & Co. sent for exhibition some well grown Tea plants of a year old, raised in Cachar, from China seed. Small collections of rare and remarkable plants were likewise sent for exhibition from the Botanic Garden, and the Society's garden.

Altogether, this may be considered as an encouraging and gratifying Exhibition. About 32 gardens competed, and prizes were awarded to 27, to the extent of Rs. 195, as per annexed list in detail.

H. CLEGHORN.
R. SCOTT.
A. H. BLECHYNDEN.

Additional remarks by Mr. R. Scott.—In quantity and in quality, I think, the Flower Show of the 10th Instant, showed clearly a decided step in advance. I do not recollect having seen at any former Show—during a period of fourteen years—so many well-flowered plants, and so many well-managed specimen plants. Very many of our annuals were represented in very effective masses. The collections of Roses showed that amateurs and native gardeners must push their studies further in the scientific use of the pruning knife; and on a better selection of kinds of Roses to be operated upon for the purpose of producing specimen plants.

Mr. G. S. Fagan's specimen of Verbena, which was awarded the best specimen prize, must have been admired by all who saw it. Mr. Grote showed many interesting plants and several new kinds of *Acanthaceæ*. Several of the specimens in Captain Paterson's collection of *Begonias* supplied models for all to copy from.

AGRICULTURAL EDUCATION.

Read a correspondence with the Director of Public Instruction on the subject of Agricultural Education in Bengal —

Resolved—On the recommendation of the Council, that the above correspondence be recorded in the proceedings of this day's Meeting.

Dr. Cleghorn read a memorandum on the naturalization of Australian plants in certain parts of India.

The following letters were also read :—

1. From Dr. J. L. Stewart, Lahore, forwarding a paper entitled "Journal of a Botanizing Tour in Huzra and Khagan." Transferred for the Journal.

2. From the Secretary Acclimatization Society of Melbourne, applying for another despatch of Eria silk-worms eggs. (To be complied with.)

3. From G. F. Cockburn, Esq., Commissioner of Patna, announcing that the Society's Silver Medal has been awarded to Mr. W. Tayler, for his English imported Bull, shown at the Agricultural Exhibition held at Mozufferpore.

4. From M. Ferrar, Esq., Honorary Secretary, Agricultural Exhibition, Rajshaye, announcing the award of the Society's Silver Medal to Mr. D. T. Gordon, for the best specimen of raw-silk.

5. From James Cowell, Esq., dated Brighton, 16th January, on the subject of a description of Cotton, introduced into Algeria from Borneo :—

"I am afraid,"—writes Mr. Cowell, "that you will have thought me quite oblivious of the request you made in your last letter respecting the Borneo

Cotton seed, referred to therein. Finding that I was not likely to visit Algiers this winter, I wrote to an old military friend residing there, and I have received his reply respecting this Cotton, only within the last week. My friend states, that he has consulted the British Consul, and also the Director of the Government Botanical Garden at Algiers, M. Harvey. The latter gentleman states, that he has sown the seed in different parts of the kingdom, and that owing to the climate not being suitable for this description, he has not succeeded in propagating it. M. Harvey says, that it becomes a *shrub* in Algeria, whereas in *Brazil* (where it is indigenous and from whence the seed must have gone to Borneo), this is a *Tree* Cotton. I think that in your letter, or memorandum sent me, you entertained the idea of its being of Brazil stock. M. Harvey does not say why it does not succeed in Algeria, but I suspect the climate is too dry, as, from May till September, no rain falls, generally. The New Orleans variety thrives best there, as it does in many, I believe most, districts in India. M. Harvey further states, that the little wool he produced of this Borneo seed was *not* of a superior quality.

"Should I again visit Algiers I will make further enquiry respecting this Cotton, although I think we have got all the information procurable."

6. From the Honorable J. F. Callagham, Governor of Labuan, intimating the despatch of some Cotton seed from the mainland of Borneo, not far from Labuan, in conpliance with an application made to him last year.

The Secretary stated that this seed had been received. It is undoubtedly the Pernambuco variety, and not a new kind of Cotton indigenous to Borneo, as was supposed, when it was sent from Sarawak to the French Consul General at Batavia, and forwarded by him to France with the view of getting it introduced into Algeria. (See communications from Mr. H. Reinhold in proceedings of March and June 1864, by whom the subject was first brought to the Society's notice.)

For the above communications and presentations, the best thanks of the Society were accorded.

(Friday, the 24th of March, 1865.*)*

A. Grote, Esq., President, *in the Chair.*

The proceedings of the last Meeting were read and confirmed.

The following Gentlemen were elected Ordinary Members:—Messrs. C. M. Smith, D. T. Shaw, William Cowan, Capt. J. W. H. Johnstone, the Rev. W. O'Brien Smith, and Capt. John Paterson.

Mr. John Floyd, was also elected an Associate Member.

The names of the following Gentlemen were submitted as candidates for election:—

Nathanael J. Ede, Esq., Merchant, Hong-Kong,—proposed by Mr. Grote, seconded by Mr. J. A. Crawford.

R. J. Carberry, Esq., Indigo Planter, Mirzapore,—proposed by Baboo P. C. Mittra, seconded by the Secretary.

C. K. Schmidt, Esq., Merchant, Calcutta,—proposed by Mr. W. Stalkartt, seconded by Mr. S. P. Griffiths.

Lieut. C. T. Lane, District Superintendent of Police, Bunnoo,—proposed by Capt. H. C. Johnstone, seconded by the Secretary.

Dr. J. H. G. Hill, Barrah, Tirhoot,—proposed by Mr. Griffiths, seconded by Mr. Cresswell.

R. H. Hill, Esq., Seraba, Tirhoot,—proposed by Mr. Griffiths, seconded by Mr. Cresswell.

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Alex. Grant, Esq., (E. I. Railway,) Myhere,—proposed by Mr. Griffiths, seconded by the Secretary.

Secretary Cantonment Public Garden, Agra,—proposed by the Secretary, seconded by Mr. W. G. Rose.

Dr. G. F. Hoff, Civil Surgeon, Bancoorah,—proposed by Mr. J. M. G. Cheke, seconded by Mr. Grote.

E. V. Westmacott, Esq., C. S., Burrisal,—proposed by Mr. C. E. Lance, seconded by the Secretary.

W. A. Ashworth, Esq., Calcutta,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

A. G. Pendleton, Esq., Agent, S.-E. Railway,—proposed by Mr. Griffiths, seconded by Mr. Pigott.

Mars Ross, Esq., Merchant, Calcutta,—proposed by Mr. T. H. Mosley, seconded by the Secretary.

The following contributions were announced:—

1. Memoirs of the Geological Survey of India, *Palæontologia Indica*, 3-5 and 3-6,—presented by Professor Oldham.
2. Selections from the Records of the Government of India, in the Public Works Department, 47,—presented by the Government of India.
3. Cuttings of rarer kinds of Roses,—presented by S. P. Griffiths, Esq.
4. Cuttings of rarer kinds of Roses,—presented by Geo. Bartlett, Esq.
5. Six kinds of Gladiolus bulbs,—presented by Capt. John Paterson.
6. A small collection of Acorns, Chesnuts, Walnuts, &c.,—presented by Col. R. R. Mainwaring.
7. A small collection of plants raised from Australian Seeds, presented by Major J. C. Dickson. The following is extract of Major Dickson's letter, in reference to these seedlings:—

First.—Nine young trees of the *Acacia longifolia* (Wild) called in the Colonies the *green* flowering Wottle tree of *Adelaide*.

This will be found peculiarly suited to the environs of Calcutta, being a beautiful *long rooted*, *shady* (*odoriferous*) and most ornamental tree; from the great strength of its timber, and length of root, quite invulnerable to the effects of the elements, possessing the advantage of the most elaborately ornamental grain, surpassing in tints, shading, color and variety (*Walnut,*) and consequently admirably suited for the manufacture of ornamental furniture; equalling, if not surpassing, in strength, the Indian *Acacia*; bearing a blossom exactly similar to it in every way except colour, which is a most beautiful bright green emitting a similar delicious odour.

Second.—Five *Mimosa* (young trees) also in excellent health and condition.

This tree is in every way similar to No. 1, except in the colour of its blossom, which is a beautiful bright canary yellow, and in the smallness of its leaf, yet so well furnished, it affords great shelter. The beautiful shady avenues of which (called the yellow Wottle of Tasmania) in the vicinity of Launceston are well known.

Third.—Four fine healthy young trees of, I believe, *Acacia verticillata variifolia*, but are too small yet for any certainty. The seeds of which were set at the same time as the others, (in the beginning of this cold season) but being apparently, although healthy, very slow of growth when compared with the other plants. The tree is called in the Colonies the black or light wood, not however black but a beautiful diversified brown colour, with grain even more beautiful than the former trees. I also send for your inspection an oil paint box made up for me under my own inspection from the timber of this tree.

The box alluded to was much admired for the beauty of its grain. Major Dickson likewise submitted, for the inspection of the Members, two books, one containing a numerous collection of Tasmanian *Algæ*, and another several dried specimens of Tasmanian plants.

8. Sample of Cotton raised in the Etah Jail, from Egyptian seed received from the Society,—presented by Dr. J. W. Tyler.

9. Sample of Cotton from the Bootan Dooars, received from the Government of Bengal.

These two specimens were referred to the Committee for report.

10. A sample collection of agricultural produce submitted for competition at the Burdwan Agricultural Exhibition, forwarded by G. E. Porter, Esq.

The following is extract from Mr. Porter's letter to the address of the President:—

"I have the pleasure to send by the bearer of this note, a box containing samples of the Agricultural Produce, &c., which gained prizes at the Burdwan Exhibition. The Committee of the Produce Department, namely, Joykissen Mookerjee, Koomar Chunder Nauth Roy, W. W. Farquharson, of Elambazar, and myself, thought that it would be a good thing to send samples to the Agricultural and Horticultural Society of India, and therefore I send the box to you as President. The Committee wish to call especial attention to the samples of Cotton fibre exhibited by Dr. Thompson, of Hooghly, and Mr. Cockburn, of Midnapore, also to Dr. Thompson's yellow dye, extracted, I believe, from the common Marigold. If, as is the present intention of the local Government, these Exhibitions become annual, samples of the prize products of different divisions would show the results of the increasing care bestowed in the tillage of the soil and cultivation of crops, and would be a very fair test of the beneficial results of the Exhibitions, in one of the main branches, *viz.*, agricultural produce."

It was agreed to apply for further particulars about some of these specimens, especially in reference to the fibre extracted from the stem of the Cotton plant.

ALTERATION IN BYE-LAWS.

The motion, of which notice was given by the Council at the last Meeting, to the effect that the words, "two of whom shall always be Natives," be omitted from Section 2 of Chapter X. of the Bye-Laws, was next brought forward. The President explained that the subject had been duly considered by the Council, and that all the Members were unanimously of opinion that, considering the small proportion of Natives as compared with European Subscribers, it would be desirable to remove the present restriction on the freedom of the action of Members at the annual Meetings of the Society.

The motion was then put to the vote and carried unanimously.

The Council next reported that, in consequence of the Town Hall not being available, and no other suitable building to be obtained for the purpose, they had agreed not to hold a second Horticultural Exhibition this year.

COTTON AND FLAX.

Reports were read from the Cotton Committee on the samples of Cotton from Etawah and the Soonderbunds, which were received from Messrs. Forrest and Hannah, and submitted at the January Meeting; and on the sample from Humeerpore, received from Dr. Fleming, and laid before the February Meeting. A report was likewise read from the Fibre Committee on the samples of Flax, the produce of indigenous seed, raised by Dr. Bonavia, in Oude, and submitted by the Chamber of Commerce at the last Meeting. In addition to the remarks of the Commitee a letter was read from Mr. Mair, Manager of the Borneo Company, reporting on these samples. Mr. Mair submits samples of bobbin, rope and yarn, prepared from this flax, and similar samples prepared from jute in contrast with the flax. The following is extract of Mr. Mair's report:—

"My opinion agrees along with the opinion of European practical Assistants I have under me, that the sample is a very low class of flax. It being so very short in fibre, makes it unsuitable to work it by itself on our present make of flax machinery; it may be practical to work it along with longer fibred flax. Its shortness would make it impracticable to be hackled and dressed by machinery, and I think to hackle and dress it by the hand the most of it would go into tow, a very little being left for flax. To export it to Britain I dont think it would command in the market a better price than between £20 to £30 per ton."

Resolved—That a copy of this report, and the specimens therein referred to, be handed to the Chamber of Commerce in reply to their Secretary's letter; also that copies of the reports on the Cotton specimens be sent to Messrs. Forrest and Hannah, and Dr. Fleming.

DACCA AGRICULTURAL EXHIBITION.

Reports were likewise submitted from the various Committees in response to the enquiries made by the Committee of the Dacca Agricultural Exhibition, at the general Meeting in December last, in reference to the prizes awarded for samples of Grain, Oil Seeds, Tobacco, Cotton, Tea, &c. The Committee wished to know, for future guidance, if the awards had been correctly given.

The reports now submitted show that, though in a few instances some mistakes have been made in giving the first prize for the second best specimen, and the second prize for the best specimen, yet, altogether, the awards have been tolerably correct.

Resolved—That copies of these reports be furnished to the President of the late Exhibition for the information of the Committee.

GRANT TESTIMONIAL FUND.

A letter was read from Mr. C. Grant offering a design for a medal in honor of Sir John Peter Grant, late President of the Society, in accordance with the Resolution passed at the general Meeting of June last. "Unable to conceive any thing *pictorial*," observes Mr. Grant, "in connection with your one time President, more appropriate than a picture of himself, which his lamented death prevented your obtaining in a more perfect form, I have thought I could not do better than adapt to the present object a profile likeness which I chance to possess, and believe to be the only one in existence representing him at the period of life at which he was known to the community of Bengal.

"The drawing referred to, from which the head in my design is taken, was a stolen sketch I took of Sir John whilst he sat on the Bench of the Supreme Court. The likeness was generally considered a good one, and although I had subsequently a sitting in private, the result was less satisfactory.

Should my design prove acceptable, I would venture a few remarks with regard to its execution. In ordinary pictorial matters, such as bullocks, ploughs and fruit, a second rate engraver may be enabled to produce nearly all the effect desirable, and satisfy the general eye. Deviations from the spirit of the original design might not be noticed; but it is far otherwise with a *Portrait*, wherein there can be *no* deviation from the original without destruction to that in which alone the interest and value lie—*likeness*. I would beg to suggest, therefore, that Mr. Leonard C. Wyon's skilful hand should if possible be employed, for less artistic skill will, I am afraid, disappoint you of the desirable return for an expense which, under any circumstances, must doubtless be heavy."

The sketch was much admired by the Members present, both in respect to style and as an excellent likeness of the late President. It was agreed that it be forwarded to Sir John Grant now in London, and that he be requested to take the necessary steps with the view of carrying into effect the wish of the Society for a handsome medal as a testimonial of his late Father.

The President informed the Members that he had, in accordance with the desire of the Council, and in anticipation of the sanction of the Meeting, offered to Mr. Grant, the special acknowledgments of the Society for the trouble he had so kindly taken in preparing the excellent design now placed on the table.

NURSERY GARDEN.

Read the following correspondence with the Government of Bengal, in reference to the offer of a piece of ground for a Garden, and to the resumption of the ground which has, hitherto, been granted to the Society for the purpose of a Nursery Garden:—

From S. C. BAYLEY, ESQ., Junior Secretary to the Government of Bengal, to the Secretary to the Agricultural and Horticultural Society, dated the 1st November 1864.

IN continuation of my Endorsement, No. 3102, dated the 26th July last, I am directed by the Lieutenant-Governor to forward the accompanying copy of a letter* from the Secretary to the Government of India, in the Home Department, conveying the sanction of His Excellency in Council, to a proposal submitted by the Lieutenant-Governor for the grant to the Agricultural and Horticultural Society of the piece of ground lying between the Allipore and Kidderpore Bridges, and bounded by the Circular Road and Tolly's Nullah, for a Nursery Garden.

* No. 3127, dated 6th October 1864.

2. His Honor desires me to enquire whether the Society are willing to take over the land on the terms mentioned in the Secretary's letter.

From E. C. BAYLEY, ESQ., Secretary to the Government of India, Home Department, to the HON'BLE A. EDEN, Secretary to the Government of Bengal,—(No. 3127, dated Simla, the 6th October 1864.)

SIR,

I AM directed to acknowledge the receipt of your letter, No. 2166T, dated the 11th August last, and in reply to state that the Governor General in Council sanctions, on the following conditions, the grant to the Agricultural and Horticultural Society, of the piece of ground lying between the Alipore Bridge and the Kidderpore Bridge, between the Road and the Nullah:—

1st.—That it shall be laid out as an *Ornamental Garden*, not as a Vegetable Garden or a Nursery.

2nd.—That no building of any kind shall be erected on it without express sanction from Government.

3rd.—That it shall be made over in such a manner as to reserve to Government the legal right of resuming it whenever it may seem necessary in the public interest to do so.

From S. C. BAYLEY, ESQ., Junior Secretary to the Government of Bengal, to the SECRETARY to the Agricultural and Horticultural Society, dated Calcutta, 8th February, 1865.

SIR,

I AM directed to call the Society's attention to the letter from this Office No. 4704, dated the 1st November last, on the subject of the ground between the Alipore and Kidderpore Bridges, and to request that a reply, to para. 2, may be submitted.

2nd.—I am to take the opportunity of informing the Society, that the Superintendent of the Botanic Garden has applied to Government, to resume the piece of ground belonging to the Botanic Garden, which the Society have been permitted to occupy, and that Dr. Anderson's application has been forwarded to the Government of India, with the Lieutenant-Governor's recommendation, that it be complied with.

From A. H. BLECHYNDEN, ESQ., Secretary Agricultural and Horticultural Society, to S. C. BAYLEY, ESQ., Junior Secretary to the Government of Bengal, Calcutta, 28th February, 1865.

SIR,

I HAVE now the honor to acknowledge receipt of your letters of the 1st of November, and 8th Instant.

2. I am desired by the Council to tender the best acknowledgments of the Society to His Honor the Lieutenant-Governor for the offer of the piece of ground lying between the Alipore and Kidderpore Bridges. The Council have duly taken this offer into consideration, and would respectfully beg leave to decline it on the conditions attached to the offer, as they are of opinion that the site in question is by no means suitable for the purposes of a Garden.

3. Referring to the second paragraph of your letter of the 8th Instant, the Council direct me to observe that they understand the Superintendent of the Botanic Garden does not at present require more than a portion of the Western side of the piece of ground belonging to the Garden, now in the occupancy of the Society,—a portion which the Society least require,— and that it is probable the remaining portion will not be required for two years. The Society will thus have time to search for a piece of ground in the immediate vicinity of Calcutta, such as may possess the necessary requirements in respect to site, &c., for the purposes of a Nursery Garden. The Council confidently hope, taking into consideration the large amount the Society have disbursed in the piece of ground which they are now called on to resign, as detailed in paragraph 6 of my letter of the 3rd February 1864, that His Honor the Lieutenant-Governor will be pleased to direct that a portion of this sum may be granted to the Society as compensation for the expenses in which this move will involve them, and towards defraying the cost of purchasing, or renting another site. The Superintendent is willing, the Society are informed, to take over the Gardener's house and other erections on the land to be surrendered, and the Society feel that they may fairly claim re-imburse-

Altogether, this may be considered as an encouraging and gratifying Exhibition. About 32 gardens competed, and prizes were awarded to 27, to the extent of Rs. 195, as per annexed list in detail.

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7. A small collection of plants raised from Australian Seeds, presented by Major J. C. Dickson. The following is extract of Major Dickson's letter, in reference to these seedlings:—

First.—Nine young trees of the *Acacia longifolia* (Wild) called in the Colonies the *green* flowering Wottle tree of *Adelaide*.

This will be found peculiarly suited to the environs of Calcutta, being a beautiful *long rooted, shady (odoriferous)* and most ornamental tree; from the great strength of its timber, and length of root, quite invulnerable to the effects of the elements, possessing the advantage of the most elaborately ornamental grain, surpassing in tints, shading, color and variety (*Walnut,*) and consequently admirably suited for the manufacture of ornamental furniture; equalling, if not surpassing, in strength, the Indian *Acacia*; bearing a blossom exactly similar to it in every way except colour, which is a most beautiful bright green emitting a similar delicious odour.

Second.—Five *Mimosa* (young trees) also in excellent health and condition. This tree is in every way similar to No. 1, except in the colour of its blossom, which is a beautiful bright canary yellow, and in the smallness of its leaf, yet so well furnished, it affords great shelter. The beautiful shady avenues of which (called the yellow Wottle of Tasmania) in the vicinity of Launceston are well known.

Third.—Four fine healthy young trees of, I believe, *Acacia verticillata variifolia*, but are too small yet for any certainty. The seeds of which were set at the same time as the others, (in the beginning of this cold season) but being apparently, although healthy, very slow of growth when compared with the other plants. The tree is called in the Colonies the black or light wood, not ho[illegible] but a beautiful diversified brown colour, with grain [illegible] more beauti[illegible] former trees. I also send for your inspection an oil paint box [illegible] under my own inspection from the timber of this tree.

The box alluded to was much admired for the beauty of its grain. Major Dickson likewise submitted, for the inspection of the Members, two books, one containing a numerous collection of Tasmanian *Algæ*, and another several dried specimens of Tasmanian plants.

8. Sample of Cotton raised in the Etah Jail, from Egyptian seed received from the Society,—presented by Dr. J. W. Tyler.

9. Sample of Cotton from the Bootan Dooars, received from the Government of Bengal.

These two specimens were referred to the Committee for report.

10. A sample collection of agricultural produce submitted for competition at the Burdwan Agricultural Exhibition, forwarded by G. E. Porter, Esq.

The following is extract from Mr. Porter's letter to the address of the President:—

"I have the pleasure to send by the bearer of this note, a box containing samples of the Agricultural Produce, &c., which gained prizes at the Burdwan Exhibition. The Committee of the Produce Department, namely, Joykissen Mookerjee, Koomar Chunder Nauth Roy, W. W. Farquharson, of Elambazar, and myself, thought that it would be a good thing to send samples to the Agricultural and Horticultural Society of India, and therefore I send the box to you as President. The Committee wish to call especial attention to the samples of Cotton fibre exhibited by Dr. Thompson, of Hooghly, and Mr. Cockburn, of Midnapore, also to Dr. Thompson's yellow dye, extracted, I believe, from the common Marigold. If, as is the present intention of the local Government, these Exhibitions become annual, samples of the prize products of different divisions would show the results of the increasing care bestowed in the tillage of the soil and cultivation of crops, and would be a very fair test of the beneficial results of the Exhibitions, in one of the main branches, *viz.*, agricultural produce."

It was agreed to apply for further particulars about some of these specimens, especially in reference to the fibre extracted from the stem of the Cotton plant.

ALTERATION IN BYE-LAWS.

The motion, of which notice was given by the Council at the last Meeting, to the effect that the words, "two of whom shall always be Natives," be omitted from Section 2 of Chapter X. of the Bye-Laws, was next brought forward. The President explained that the subject had been duly considered by the Council, and that all the Members were unanimously of opinion that, considering the small proportion of Natives as compared with European Subscribers, it would be desirable to move the present restriction on the freedom of the action of Members at the annual Meetings of the Society.

The motion was then put to the vote and carried unanimously.

The Council next reported that, in consequence of the Town Hall not being available, and no other suitable building to be obtained for the purpose, they had agreed not to hold a second Horticultural Exhibition this year.

COTTON AND FLAX.

Reports were read from the Cotton Committee on the samples of Cotton from Etawah and the Soonderbunds, which were received from Messrs. Forrest and Hannah, and submitted at the January Meeting; and on the sample from Humeerpore, received from Dr. Fleming, and laid before the February Meeting. A report was likewise read from the Fibre Committee on the samples of Flax, the produce of indigenous seed, raised by Dr. Bonavia, in Oude, and submitted by the Chamber of Commerce at the last Meeting. In addition to the remarks of the Commitee a letter was read from Mr. Mair, Manager of the Borneo Company, reporting on these samples. Mr. Mair submits samples of bobbin, rope and yarn, prepared from this flax, and similar samples prepared from jute in contrast with the flax. The following is extract of Mr. Mair's report:—

"My opinion agrees along with the opinion of European practical Assistants I have under me, that the sample is a very low class of flax. It being so very short in fibre, makes it unsuitable to work it by itself on our present make of flax machinery; it may be practical to work it along with longer fibred flax. Its shortness would make it impracticable to be hackled and dressed by machinery, and I think to hackle and dress it by the hand the most of it would go into tow, a very little being left for flax. To export it to Britain I dont think it would command in the market a better price than between £20 to £30 per ton."

Resolved—That a copy of this report, and the specimens therein referred to, be handed to the Chamber of Commerce in reply to their Secretary's letter; also that copies of the reports on the Cotton specimens be sent to Messrs. Forrest and Hannah, and Dr. Fleming.

DACCA AGRICULTURAL EXHIBITION.

Reports were likewise submitted from the various Committees in response to the enquiries made by the Committee of the Dacca Agricultural Exhibition, at the general Meeting in December last, in reference to the prizes awarded for samples of Grain, Oil Seeds, Tobacco, Cotton, Tea, &c. The Committee wished to know, for future guidance, if the awards had been correctly given.

The reports now submitted show that, though in a few instances some mistakes have been made in giving the first prize for the second best specimen, and the second prize for the best specimen, yet, altogether, the awards have been tolerably correct.

Resolved—That copies of these reports be furnished to the President of the late Exhibition for the information of the Committee.

GRANT TESTIMONIAL FUND.

A letter was read from Mr. C. Grant offering a design for a medal in honor of Sir John Peter Grant, late President of the Society, in accordance with the Resolution passed at the general Meeeting of June last. "Unable to conceive any thing *pictorial*," observes Mr. Grant, "in connection with your one time President, more appropriate than a picture of himself, which his lamented death prevented your obtaining in a more perfect form, I have thought I could not do better than adapt to the present object a profile likeness which I chance to possess, and believe to be the only one in existence representing him at the period of life at which he was known to the community of Bengal.

"The drawing referred to, from which the head in my design is taken, was a stolen sketch I took of Sir John whilst he sat on the Bench of the Supreme Court. The likeness was generally considered a good one, and although I had subsequently a sitting in private, the result was less satisfactory.

Should my design prove acceptable, I would venture a few remarks with regard to its execution. In ordinary pictorial matters, such as bullocks, ploughs and fruit, a second rate engraver may be enabled to produce nearly all the effect desirable, and satisfy the general eye. Deviations from the spirit of the original design might not be noticed; but it is far otherwise with a *Portrait*, wherein there can be *no* deviation from the original without destruction to that in which alone the interest and value lie—*likeness*. I would beg to suggest, therefore, that Mr. Leonard C. Wyon's skilful hand should if possible be employed, for less artistic skill will, I am afraid, disappoint you of the desirable return for an expense which, under any circumstances, must doubtless be heavy."

The sketch was much admired by the Members present, both in respect to style and as an excellent likeness of the late President. It was agreed that it be forwarded to Sir John Grant now in London, and that he be requested to take the necessary steps with the view of carrying into effect the wish of the Society for a handsome medal as a testimonial of his late Father.

The President informed the Members that he had, in accordance with the desire of the Council, and in anticipation of the sanction of the Meeting, offered to Mr. Grant, the special acknowledgments of the Society for the trouble he had so kindly taken in preparing the excellent design now placed on the table.

NURSERY GARDEN.

Read the following correspondence with the Government of Bengal, in reference to the offer of a piece of ground for a Garden, and to the resumption of the ground which has, hitherto, been granted to the Society for the purpose of a Nursery Garden :—

From S. C. BAYLEY, ESQ., Junior Secretary to the Government of Bengal, to the Secretary to the Agricultural and Horticultural Society, dated the 1st November 1864.

IN continuation of my Endorsement, No. 3102, dated the 26th July last, I am directed by the Lieutenant-Governor to forward the accompanying copy of a letter* from the Secretary to the Government of India, in the Home Department, conveying the sanction of His Excellency in Council, to a proposal submitted by the Lieutenant-Governor for the grant to the Agricultural and Horticultural Society of the piece of ground lying between the Allipore and Kidderpore Bridges, and bounded by the Circular Road and Tolly's Nullah, for a Nursery Garden.

2. His Honor desires me to enquire whether the Society are willing to take over the land on the terms mentioned in the Secretary's letter.

From E. C. BAYLEY, ESQ., Secretary to the Government of India, Home Department, to the HON'BLE A. EDEN, Secretary to the Government of Bengal,—(No. 3127, dated Simla, the 6th October 1864.)

SIR,

I AM directed to acknowledge the receipt of your letter, No. 2166T, dated the 11th August last, and in reply to state that the Governor General in Council sanctions, on the following conditions, the grant to the Agricultural and Horticultural Society, of the piece of ground lying between the Alipore Bridge and the Kidderpore Bridge, between the Road and the Nullah :—

1st.—That it shall be laid out as an *Ornamental Garden*, not as a Vegetable Garden or a Nursery.

2nd.—That no building of any kind shall be erected on it without express sanction from Government.

3rd.—That it shall be made over in such a manner as to reserve to Government the legal right of resuming it whenever it may seem necessary in the public interest to do so.

* No. 3127, dated 6th October 1864.

From S. C. Bayley, Esq., Junior Secretary to the Government of Bengal, to the Secretary to the Agricultural and Horticultural Society, dated Calcutta, 8th February, 1865.

Sir,

I am directed to call the Society's attention to the letter from this Office No. 4704, dated the 1st November last, on the subject of the ground between the Alipore and Kidderpore Bridges, and to request that a reply, to para. 2, may be submitted.

2nd.—I am to take the opportunity of informing the Society, that the Superintendent of the Botanic Garden has applied to Government, to resume the piece of ground belonging to the Botanic Garden, which the Society have been permitted to occupy, and that Dr. Anderson's application has been forwarded to the Government of India, with the Lieutenant-Governor's recommendation, that it be complied with.

From A. H. Blechynden, Esq., Secretary Agricultural and Horticultural Society, to S. C. Bayley, Esq., Junior Secretary to the Government of Bengal, Calcutta, 28th February, 1865.

Sir,

I have now the honor to acknowledge receipt of your letters of the 1st of November, and 8th Instant.

2. I am desired by the Council to tender the best acknowledgments of the Society to His Honor the Lieutenant-Governor for the offer of the piece of ground lying between the Alipore and Kidderpore Bridges. The Council have duly taken this offer into consideration, and would respectfully beg leave to decline it on the conditions attached to the offer, as they are of opinion that the site in question is by no means suitable for the purposes of a Garden.

3. Referring to the second paragraph of your letter of the 8th Instant, the Council direct me to observe that they understand the Superintendent of the Botanic Garden does not at present require more than a portion of the Western side of the piece of ground belonging to the Garden, now in the occupancy of the Society,—a portion which the Society least require,— and that it is probable the remaining portion will not be required for two years. The Society will thus have time to search for a piece of ground in the immediate vicinity of Calcutta, such as may possess the necessary requirements in respect to site, &c., for the purposes of a Nursery Garden. The Council confidently hope, taking into consideration the large amount the Society have disbursed in the piece of ground which they are now called on to resign, as detailed in paragraph 6 of my letter of the 3rd February 1864, that His Honor the Lieutenant-Governor will be pleased to direct that a portion of this sum may be granted to the Society as compensation for the expenses in which this move will involve them, and towards defraying the cost of purchasing, or renting another site. The Superintendent is wishing, the Society are informed, to take over the Gardener's house and other erections on the land to be surrendered, and the Society feel that they may fairly claim re-imburse-

ment, on a valuation of the out-lay, which has converted what was originally a piece of almost waste land into an useful and ornamental Garden.

Resolved—That the above Correspondence be inserted in the proceedings of this day's Meeting.

LUCKNOW AGRICULTURAL EXHIBITION.

Read a letter from W. Halsey, Esq., Secretary, Agricultural and Hoticultural Society, enclosing a Memorandum on the Lucknow Exhibition, and requesting the consideration of this Society in respect to the various subjects therein discussed.

The Secretary submitted the Memorandum in question, and read the reply to Mr. Halsey's communication, as follows:—

Memorandum on the Lucknow Exhibition by the Secretary, Benares Agricultural Society.

I leave to others, better able than myself, to describe the successful opening of the Exhibition of 1864 at Lucknow, which has been decidedly and emphatically a success, both as regards the beauty of the spot, the extreme taste displayed in laying out the grounds, and, what has hitherto been the failing in all Exhibitions in India, the completeness of the preparations previous to opening; my object in writing this memorandum is to point out, whilst it is yet time, the necessity of fixing some definite rules for the judging of cattle. In every Agricultural Show, the object of offering prizes should be most distinctly stated, whether the object be to raise cattle for the labour of the country, or for dairy purposes, or for both; and every endeavour and inducement should be held out to the few good judges in the country to give their minds to the subject, and if unable to attend themselves, to point out some few of the fundamental principles of breeding, as sanctioned and defined by the judges of cattle in England. Upon these grounds, I am of opinion, that all judging should be carried on in the presence of the owners who wish to attend, (the same as is now done in England); and the greatest care taken to explain to all, the principles upon which the decisions have been made. If this is not done, the whole object of these Shows is lost, and even the few who wish to obtain information are thrown all abroad by seeing the decisions of other Shows completely reversed, and that without any specific reason. For the same reason, it will be most desirable for all the known breeds of cattle in India to be at once defined and a standard created, and I think it is the duty of the various Agricultural Societies to take immediate action with this object, they being in a better position to arrive at a clear and decisive opinion in the matter.

Having said this much, I proceed to criticise the cattle brought forward for competition at Lucknow. First, as regards the classification adopted, which is unquestionably very faulty. In the classes for Bulls bred or owned in Oude, the terms are over 2 years and under 5 years, even in England where men have been at it all their lives, it would be accounted very rash in any one to decide that perfection at 2 years is equal or superior to perfectio at 5 years, the one having arrived at maturity must be considered the best, as it is impossible to foretell what the constitution may bring out during the three years' growth, before the 2 years' old comes to maturity. So again with Cows, the conditions required are, the Cows be under 7 years and with calf at foot; though how with no herd book and the extremely indefinite memories of natives, any person is to tell whether a Cow is six, seven, eight or even in some cases, nine, passes my comprehension; so also I fail to see the difference between a Cow in calf, and a Cow with calf at foot.

To proceed to the animals. In the first class, bred and owned in Oude, the limit of 5 years reduced the competition to nil, and resulted in two coarse bred but strong and stout made Bulls carrying off the second and third prizes, animals certainly calculated to produce good Bullocks, but I should say nothing else, being of the same stamp as the well known Nanparah Bullocks, so much and deservedly prized for their compact shape and strength, activity and endurance with the plough. These Bullocks having the advantage of being moreover very cheaply kept. I have omitted to mention of the animal which got the first prize, as nothing but *good policy* can have gained him the prize, combined, I am sorry to say, with bad judgment, he being a flat sided, leggy and thoroughly unprofitable brute, with a lot of Hansi blood in him. Of the two above mentioned, I may remark that the most blood, and to my taste by far the finest specimen, considering that he will still improve, was Shere Shingh's Bull, and to any one wanting good plough Bullocks, I commend him as one of the best for stock purposes I have seen out this year.

In the 2nd class, owned by a resident of Oude, but bred any where, there was nothing of note, the class being evidently invented for the temporary residents; witness Mr. Farrel's 2 year old Bull, which was shown last year in Calcutta as a yearling; the owner having changed his residence in the meanwhile, competes and carries off the 3rd prize, for what is undoubtedly a very shapely animal, but at the same time, heavy and coarse.

In the 3rd or all comers class, I must protest against the cross bred Bull "Hero" being overlooked. Doubtless many of your readers will recollect the large brindled Bull who took so many prizes last year and ran Mr. Wise's Bull very hard for the silver medal at Calcutta, losing it only in consequence of his being too large to serve the Bengalee Cows. If there is any animal which has been before the public since these Shows have commenced, (and he has been in the hands of three different sets of judges,) who so completely combines the three qualities—meat, strength, and milk, this is the one. Got by a short horn Bull out of a Hansi Cow, on the one side, the well known meat and milking qualities of the short horn race; and from the other side that compactness of form which has made the Hansi Bullock famous through India for its enormous strength under the heavier forms of labour. There is yet another advantage which ought not to be overlooked in en-encouraging this, the only form as yet of cross bred which promises success, I refer to the extraordinary precocity of the short horn. It is, I believe, a well known defect in Indian Cows that they rarely give a calf within the twelve months, most within 15 months, and many do not give more than one in 18 months, and some I have known, not within two years. No doubt careless feeding and the very short time a Cow is in season, (in the hot weather some times only a few hours) has something to do with this, but it cannot be doubted that it is a serious defect for a breeder to have to contend with, and any thing that holds out any hope of improvement ought to be encouraged.

However it all resolves itself into what the definition of "Best Bull" means, and this is another error in the classification. If by best be meant the best Bull for breeding plough cattle only, then, I am prepared to admit he is not the best, and the Nanparah caste is the best; and the animal which ought to have had the prize was Rajah Man Sing's fine 8 year old Bull, which many will remember as forming one of a pair in Calcutta last year. I will venture to say he is as big again in girth as Ishk Lal's Bull and able to do twice the work, and lost this prize undoubtedly because the judges would look at nothing which had not a touch of the Scinde breed in it. Of course if their object was the dairy, as far as he was concerned they were right, but this is only another instance of the faultiness of the catalogue; and the fact of the English Bull Hector being past over and also the half bred short horn "Hero" leaves every one in doubt as to the principles, if any but political, which guided the judges in their decision.

In the class of Cows the same system of classification was adopted, and almost identically the same mystification arises as to the object for which the prizes were given. If compactness, bone, shape, and make, go for anything, then, in my humble opinion, among the Oude Cows there was nothing equal to Major Chamberlain's and Ishk Lal's red Cow, both Cows being in all those points far superior either to Rajah Deonarain Sing's Cow or Ishk Lal's black Cow; but here again no doubt the Scinde feeling prevailed, and again I repeat it is very necessary to determine at once what we are giving prizes for, in point of fact, what stamp of animal we are encouraging people to breed.

The Cows showed in better form than the Bulls, and among them I noticed a large, fine skinned, roomy Cow of Man Sing's, a very promising little red Cow of Mr. Taylor's, of Luckimpoor, and a red Cow belonging to the Rajah of Bulrampoor, also very promising. I noticed also a Goojerattee Cow of the Rajah of Bulrampore's, certified to be one of a herd of 150; it occurred to me that with such accuracy as was generally required throughout the Show, it was a pity this certificate was posted up.

Among the Bullocks I was sorry to see Nanparah, Doorehra and the Tera districts so badly represented, the noticeable few that were exhibited were from Hansi and the West, and if I had to select a pair my choice would have fallen on Rajah Dya Shunker's pair of Nagore Bullocks.

Altogether in the cattle classes the Show was remarkably poor, and could not vie in interest with Messrs. Thomson and Co. and Messrs. Lepage & Co's. machinery, or Messrs. Hamilton and Co., and that general benefactor, Charles Nephew and Co.

Sheep, except in the weather class, were very poorly represented, and among poultry there were very few pens of average goodness; this was perhaps as well, as here again the principle of judging not having been defined, the judges simply decided by size, a quick and practical method, though rather contrary to English poultry fanciers' notions.

So also in the matter of butter, the principle laid down was that butter made from cream was inferior to butter made from milk.

All this was very right, no doubt, only it was a pity, seeing that Oude people take a different view of things to outsiders, that all this was not specified before.

You will observe perhaps from these remarks, a slight tinge of discontent, being one of the outsiders. I don't mind admitting a certain amount of that feeling. The grain I was the means of bringing forward at the Exhibition though a certified sample of 5 seers, was, though admittedly superior to any thing exhibited, disqualified by not being certified as a sample of 10 maunds, and I leave it.to your judgment to decide how many of those who certified to the 10 maunds. took the trouble to satisfy themselves of the existence of the 10 maunds, Indeed this very condition was a complete bar to any cultivator exhibiting, as it is well known, that all grain goes straight to the Mahajun's from the threshing floor, (indeed were it not so, how did Benarsee Dass obtain so many prizes for grain, he having no land of his own,) and that no cultivator can by any possibility have that amount of grain by him, unless natives as well as Europeans do things differently accross the border.

There are Shows still to take place both at Muzufferpoor, Agra and Burdwan, and I trust that all the Committees of these respective places will bear in mind what I have written, and will give me credit for being sincerely and deeply interested in the future success of Agricultural Shows, and that it is in no spirit of captiousness that I have written this memorandum, but with an honest desire to set right, an uncertainty, which I believe, if not put a stop to, will irreparably injure the cause of these Exhibitions.

W. S. HALSEY, Esq.,
Secretary, Agricultural and Horticultural Society, Benares.

DEAR SIR,

IN continuation of my letter of the 13th January last, I am directed by the Council to state, that they have carefully considered the subject matter of your letter of the 8th Idem, and the memoradum therein referred to.

The Council bid me now state, in reply, that in their opinion it is almost impossible in the first outset of such experiments as these recent and novel Agricultural Exhibitions have been, to ensure accuracy and perfection. You probably do not expect them to express any opinion on your criticisms of the awards of the various judges at district Shows, noticed in your memorandum. The Council, however, request me to thank you for the memorandum in question, as they conceive there is much force and truth in your remarks. There is, no doubt that the vagueness of the terms of the prize lists has been a source of difficulty, and should be avoided. The Council must look partly to time and an improved knowledge of the subject to remedy these.

With the view of aiding those who may hereafter be entrusted with the preparation of prize lists, the Society have directed a communication to be made to the Royal Agricultural Society of England, and the Highland Society of Scotland for sets of the Rules in force with them. They are also about to address His Honor the Lieutenant-Governor, suggesting the appointment of a Committee to revise the prize lists for the Bengal Districts, so far as the grants from Government are concerned; and these lists may, probably, with some modification, be useful in assisting judges at future Exhibitions in the North-Western Provinces.

Your's, &c.,

March 21*st*, 1865. (Sd.) A. H. BLECHYNDEN,

Secretary.

Resolved—That the above be recorded in the proceedings of this day's Meeting.

ESSAYS ON THE CULTIVATION AND MANUFACTURE OF TEA.

Letters were read from Messrs. B. W. Hallifax, and W. C. Muller, of Darjeeling, forwarding Essays on Tea culture and manufacture, as applicable to the Hills; and from Mr. H. A. Shipp, of Cachar, an Essay on the same subject, as applicable to the plains. These are sent in to compete for the prize offered last year by the Society. The Council intimated that they had appointed a Special Committee, consisting of Messrs. Haworth, Minto and Eddis, to report on these Essays.

CULTURE OF THE COTTON PLANT UNDER PARTIAL SHADE.

A letter on this subject from Mr. John Powel, of Rosa, near Shajehanpore, was next read, in continuation of some remarks submitted last year, of which the following are extracts:—

"I have not written to you lately, because, I was desirous of seeing the results from another season's growth of Cotton before doing so. You will remember perhaps my stating that there was some advantage in having a partial shade; this idea has been confirmed very much, for wherever there was a shade there the plants were more vigorous, and there they have been less subject to the action of frost, and consequently, in this spring time, are shooting out much stronger shoots than those in more exposed situations. By partial shade, I mean in situations either surrounded by large trees, or where trees are pretty regularly dispersed over the ground, these latter having all the lower branches lopped of. The forest lands are, therefore, peculiarly adapted for the growth, as the soil is rich and the required shade is obtained by leaving the larger trees standing.

"It does not appear that the quality of the Cotton deteriorates in this district, nor that the plants are less vigorous from the acclimated seed; on the contrary I find that the seed gives a much more healthy plant than I obtained the first year from that imported, which you kindly forwarded to me.

"The produce per acre in one spot surrounded by trees was 2⅓ maunds per acre, about 2 maunds, of which will be No. 1 quality, 15 seers of No. 2 quality, and the rest, tow or refuse; and taking an average of seasons it would appear that about 2 maunds can be obtained per acre, *i. e.*, during favorable seasons 2½ maunds might be the average, and in unfavorable seasons 1½ maunds, and supposing the average to be 2 maunds per acre, the cost of producing will not be above *7d.* per lb., and under favorable circumstances might not exceed *5d.* To produce it, though thus cheaply, there must be experienced management and the Cotton must be ginned by the improved American gins. The Native churka although it gives the fibre entire naps the Cotton, and makes it dirty although the greatest care be taken, and besides the expense is enormous. Ginned by churkas the cost per maund is not less than Rupees 3, and is more likely to be Rupees 4 and 5 per maund. Ginned by Emery's improved saw gin I find that the cost is about 1 per maund, and the Cotton comes away as if it had been bowed.

"Opinions differ as to the time for sowing the seed, and with some reason. There are no doubt advantages, as well as disadvantages in sowing late, but I think the latter prevails over the former. Seed sown when the rains set in, do not produce large trees, and if the water rests on the soil at all, the trees remain very stunted, but if the ground be sloping and the growth is fair, the return, according to the size of the plants, is great; but seed sown in spring before the hot winds come on germinate vigorously, the roots find their way well into the soil, wood is formed above, the hot wind is resisted, and when the rain comes the young plant soon springs up into a large bush; the larger size gives the greater number of pods, but they are not so closely set as in the smaller plants. The latter method of sowing is the surer, but there is the drawback that, there is an expense in watering. What that may be, depends on the weather, but taking an average of seasons, I would say 4 waterings, *i. e.*, one before sowing, one when the first leaves appear, one again during the month of April, and one during the month of May: each watering from wells costs from Rs. 1-8 to 2-8 per acre.

"It would be very advantageous to use the steam plough, in preparing ground for Cotton, but in new forest land it is impossible to do so on account of the number of roots spread under the surface.

"The Egyptian kind does not give a good return, and I would say, that it is not likely to answer at all in this part of the country, unless it becomes more hardy by acclimazation; heavy falls of rain injure it, and there is but little produce until the latter part of the year, when the frost sets in and kills the branches. The last season being a dry one, comparatively speaking, the plants gave a greater return than any I have had during any previous year; whether this arose entirely from the dryness or from acclimazation, is a point to be solved hereafter.

"Emery's patent saw gin, improved by Burgess and Key, is a very effective instrument for separating the seed from the Cotton. The one I have has 13 saws, and 5 men work it regularly during 10 hours, the result is 35 seers of clean Cotton. The prospectus mentions a much greater quantity per diem, and perhaps a little more than 35 seers would be the result, worked quicker, but the saws seem to go fast enough consistent with safety. To do the same amount of work with the native churka, 40 women at least would be necessary.

" I have sent samples to Calcutta which will be made over to you, and I shall feel obliged if you will report thereon."

A letter was also read from Dr. J. L. Stewart, Conservator of Forests in the Punjab, forwarding the second part of his interesting paper relative to his Botanizing tour in Hazra and Khazan. (Transferred for the Journal.)

For the foregoing contributions and communications the best thanks of the Society were accorded.

(Monday, the 24th of April, 1865.)

A. Grote, Esq., President, *in the Chair*.

The proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected Members :—Messrs. N. J. Ede, R. J. Carberry, C. K. Schmidt; Lieut. C. T. Lane, Dr. J. H. G. Hill, Messrs. R. H. Hill, H. Lushington, Alex. Grant, Secretary Cantonment Public Garden ; Dr. G. F. Hoff, Messrs. E. V. Westmacott, W. A. Ashworth, A. G. Pendleton, and Mars Ross.

The names of the following Gentlemen were submitted as candidates for election :—

T. Maltby, Esq., District Superintendent of Police, Burrisaul,—proposed by Mr. C. E. Lance, seconded by the Secretary.

The Maharajah of Bhurtpore,—proposed by Mr. E. C. Bayley, seconded by Mr. Grote.

Capt. C. K. Walter, Political Agent, Bhurtpore,—proposed by Mr. Bayley, seconded by Mr. Grote.

James Cockburn, Esq., District Superintendent of Police, Jessore,—proposed by Mr. J. R. Savi, seconded by the Secretary.

The Honorable Geo. Campbell,—proposed by Mr. Grote, seconded by Captain W. N. Lees.

The following contributions were announced :—

1. Reports for 1863-64 on the Administration of the N. W. P., the Madras Presidency, Central Provinces, Punjab Territories, and Hyderabad Assigned Districts,—presented by the Government of Bengal.
2. Journal of the Asiatic Society, No. V. of 1864,—presented by the Society.
3. A packet of Tusser Cocoons from Bancoorah,—presented by Lieut R C. Beavan.

Mr. Samuel Jennings exhibited four exceedingly well-grown plants of *Caladiums*, including *C. argyrites*, and *C. Chantinii*, and submitted the following note of his mode of treatment:—

"These plants should be grown in a rich soil, with a sprinkling of silver sand, good drainage and lumps of charcoal mixed in the mould. They die down in the cold weather and then water should be gradually witheld. The bulbs can then be taken up and put into silver sand until February, when they should be divided, when practicable, and planted out in small pots filled with silver sand until well started, when they should be transferred to larger pots and plenty of water given. When in full vigour of growth, as they now are, they should stand constantly in water, and be kept in a cool and shady place."

SALT WATER LAKE RECLAMATION COMPANY.

Read the following letter and reply thereto, in connection with a proposal from the above Company:—

From the SECRETARIES to the Salt Water Lake Reclamation and Irrigation Company, Limited, to A. H. BLECHYNDEN, ESQ., Secretary to the Agricultural and Horticultural Society, dated Calcutta, 31st March 1865.

We have been requested by the Directors of this Company to seek through you the assistance and co-operation of the Agricultural and Horticultural Society of Bengal, in certain preliminary experiments that they propose to conduct without loss of time, in the cultivation of various crops upon land reclaimed from the Salter Water Lake, and manured with sewage.

The prospectus of this Company, which we enclose, will show you the character of the operations that are to be undertaken; many square miles of swamp and jungle are to be reclaimed, cultivated, and fertilized, and the Directors think that in such a work of great public utility connected with agriculture, they may fairly hope for such assistance from the Agricultural and Horticultural Society of Bengal, as it may be within their province to afford.

One square mile of land, close to the new sewerage outlet, has been reclaimed from the Lake, and the form in which the Directors look for your assistance is as follows, *viz*:—That the Agricultural and Horticultural Society superintend the experimental cultivation of this piece of land, by dividing it into fields for the growth of various crops under various conditions, at the expense and risk of the Company.

The Directors believe that an experiment of this kind, conducted upon a large scale, under the able management of your Society will, practically, illustrate the value of improved modes of culture and of the use of manure, not only to those ryots who may be expected hereafter to cultivate lands to be reclaimed from the Salt Water Lake, but equally so to the whole of Bengal.

From the SECRETARY, Agricultural and Horticultural Society, to MESSRS. MACKILLOP, STEWART & Co., Secretaries to the Salt Water Lake Reclamation and Irrigation Company Limited, dated 22nd April 1865.

I am instructed by the Council of the Agricultural and Horticultural Society to acknowledge your letter of the 31st March, requesting the assistance and co-operation of the Society in certain preliminary experiments, which your Directors wish to conduct on the cultivation of various crops upon land reclaimed from the Salt

Water Lake, and manured with sewage. Your Directors request the Society to superintend the cultivation of one square mile of land at the expense and risk of your Company.

In reply, I am directed to intimate that, with every disposition to aid in so useful an object as that proposed, the Council, after giving the subject due consideration, are not disposed to superintend such experiments, as it would involve an amount of labor and responsibility which they are not prepared to undertake. The Council are of opinion, that your Company could not adopt a better plan than to engage the services of an experienced practical Agriculturist,—an Indigo Planter for instance,—one who is well acquainted with the application of manures to various crops. The Council will willingly undertake, on behalf of the Society, to render every assistance in their power, and to furnish any one so appointed with seeds and useful plants on which to institute the required experiments.

FRUIT OF THE HILL BAMBOO.

Read the following extracts of two letters from Mr. W. Le F. Robinson, of Rungpore, dated 2nd and 16th April, to the address of Mr. Grote, and submitted the specimens of fruit therein referred to:—

"I believe you take an interest in Agricultural matters, and, as I was yesterday shown a thing I have never seen before, I write to ask you if it is worth sending down to Calcutta. It is the fruit of a Bamboo. They have flowered here this year, but now one has borne fruit, and it may be a curiosity, as no native that I have seen has ever seen one *here* before, though people have seen them in the Garrow Hills; they tell me this Bamboo is a hill one, and I dare say was brought from the Garrow Hills, but that can be easily ascertained if it is of any interest; the fruit is of irregular shape and size, and when you cut it open there is a cavity in the centre where I expected to find a stone of some sort, but instead of that there was nearly an egg-spoon-ful of perfectly clear water. It may, for all I know, be nothing out of the common, but the people here are so evidently astonished at it, and as I have never seen one before myself, I write to you on the chance of its being of interest to the Agricultural and Horticultural Society, and if so, I shall be very happy to send a specimen down. The fruit appears to me unripe at present, but I have put a man to look after the clump and secure some of them remaining on the Bamboos, to see if they get ripe or what happens to them. I hope you will excuse my troubling you on the subject."—*April* 2nd, 1865.

"You will find in the box, also besides the fruit, some of the old flowers or seeds from the same Bamboo. I have made enquiries as to where the Bamboos came from, and they are said to have been brought from the Hills opposite Chilmaree,—some part of the Garrow Hills. I think the man to whom they belong says, they were brought by some member of his family, three generations ago, and have never flowered or fruited before. The fruit does not seem to be inclined to ripen on the Bamboo. I have sent you large ones, but many are very small, about the size of a bullet, only of a long shape tapering to a point, and these drop off the plant and come to nothing, apparently; however, I am having a watch kept on the clump to see what happens to the survivors, but very many have been carried off by curious natives."—*April 16th*, 1865.

The Secretary called attention, in connection with the above, to the pericarp of a Bamboo (*Bambusa baccifera ?*) which Mr. W. F. Campbell had sent down from Tipperah, and which was submitted at the Meeting in October last. It is much smaller than the specimens received from Mr. Robinson.

Letters were also read:—

1. From the Secretary, Government of Bengal, dated 4th April, enclosing letter from the Superintendent of the Botanical Gardens, requesting that the necessary arrangements may be made for restoring, with as little delay as possible, the plot of ground occupied by the Society in the Botanical Gardens.

2. From the Superintendent of the Botanical Gardens, dated 8th April, requesting to be informed when the ground, referred to in the letter from the Secretary to the Government of Bengal, can be made over to him.

The Secretary intimated that the necessary arrangements had been made for the transfer of the western portion of the ground, the part more immediately required by Dr. Anderson.

3. From Secretary, Government of Bengal, dated 7th April, submitting for the information of the Society, a correspondence with the Commissioner of Dacca, giving the results of the Dacca Agricultural Exibition.

(*Friday, the 26th of May 1865.*)

A. Grote, Esq., *President, in the Chair.*

The proceedings of the last Meeting were read and confirmed.

Before commencing the business of the Meeting, the President, in a few words, announced the regret with which he had, on the previous day, heard of the death of one of the Society's Office Bearers, Mr. W. G. Rose, who had been a Member of the Society since 1837, and who had, until his health began to fail, been so assiduous in his attendance at their Meetings. There had not been time for him (the President) to consult his colleagues in the Council, but he felt that he might, on such an occasion, anticipate their concurrence in the proposa lwhich he had now to make to the Meeting, namely, that it should put on record an expression of its regret at the loss which the Society had experienced. He had drafted a Resolution to that effect, which he would now read to the Meeting:—

That this Meeting having just been made aware of the demise of Mr. W. G. Rose, desires to place on record its sense of the loss of an old and valuable Member, who, for 28 years, during which period he was frequently a Vice President, so cordially and zealously co-operated, in every effort, for the advancement and prosperity of the Society. Carried unanimously.

The following Gentlemen were elected Members:—

Captain C. K. Walter, the Maharajah of Bhurtpore, Messrs. T. Maltby and James Cockburn, and the Honorable Geo. Campbell.

The names of the following Gentlemen were submitted as candidates for election:—

Arthur D. Smart, Esq., Jorehaut, Assam,—proposed by Mr. S. Jennings, seconded by the Secretary.

E. Molony, Esq., c. s., Jessore,—proposed by Mr. Grote, seconded by Mr. S. P. Griffiths.

Baboo Onooroop Chunder Mookerjee,—proposed by Baboo Peary Chand Mittra, seconded by Baboo Shib Chunder Deb.

The Secretary Local Fund Committee, Goorgaon,—proposed by the Secretary seconded by Mr. J. Agabeg.

The Secretary, Assam Company,—proposed by Mr. W. J. Judge, seconded by Mr. S. H. Robinson.

Major H. T. Bartlett, Bengal Staff Corps, Saugor,—proposed by Brigadier General J. Travers, seconded by the Secretary.

T. C. Vertannes, Esq., c. e., Cuttack,—proposed by Mr. Jos. Agabeg, seconded by the Secretary.

Lieut.-Coll. J. R. Abbott, Calcutta,—proposed by Mr. Judge, seconded by Mr. Robinson.

A. N. Cole., Esq., Manager of the Bettiah Rajah's Estate, Arrah,—proposed by Mr. C. E. Lance, seconded by the Secretary.

Geo. Keighley, Esq., Calcutta,—proposed by Mr. Judge, seconded by Mr. Robinson.

Lieut.-Coll. Goode, Madras Army, Cuttack,—proposed by Mr. R. N. Shore, seconded by Mr. G. N. Barlow.

Dr. F. R. Thompson, Hooghly,—proposed by Mr. Grote, seconded by Mr. Griffiths.

The following contributions were announced:—

1. Le Bon Jardinier for 1855, Vols. I and 2. Presented by Dr. Tonnerre.

2. Selections from the Records of the Government of India, No. 48. Presented by the Government of Bengal.

3. Major Sherwill's Geographical and Statistical Report of the Dinagepore District. Presented by the Government of Bengal.

4. The 13th Annual General Meeting of the British India Association. Presented by the Association.

5. Small collections of Orchids from Darjeeling and Sylhet. Presented by S. Jennings, Esq.

6. A small collection of Plants from the Royal Botanic Garden. Presented by Dr. Anderson.

7. Seeds of a species of *Thurnbergia (T. laurifolia ?)* from Assam. Presented by W. G. Wagentreiber, Esq.

8. A packet of seeds of the China Tallow tree, (*Stillingia sebifera)* acclimated in the Botanic Garden in Algiers. Presented by James Cowell, Esq.

9. A log of Box-wood. Presented by W. Haworth, Esq.

10. Two samples of safflower, prepared at Lucknow from the Dacca seed received last year from the Society. Forwarded by Dr. E. W. Bonavia for report and valuation.

The Secretary read the following report, which had been obligingly furnished by Messrs W. Moran & Co.—

"We have received your two samples of Safflower; No. 1 appears to us to be scarcely equal to No. 3 quality, as generally shipped from Calcutta. It is coarse in the leaf, as though it had been picked too late. It does not possess that *pinky* colour that is characteristic of *good* Safflower, neither have the cakes that compact and solid appearance that good Safflower possesses.

"No. 2 would not be taken for Safflower by any Shipper. It has the *smell* of Saffron without its appearance, and the colour is decidedly bad.

"It is impossible to fix a market value for either sample. No. 1, might possibly find a purchaser, but we do not think No. 2, marketable. If this Safflower were shipped in this condition, as represented by the samples, it would arrive in London as dust, there being no compactness or durability in the cakes.

"We send you herewith a remnant of some of last season's Safflower, which was sold at Rs. 40, but which has much deteriorated in strength and appearance from being kept so long; this sample however will suffice to show you the character of Safflower shipped from this Port."

A list in detail was submitted by the Gardener of the fruit trees which were destroyed by the Cyclone of October last, and of those which have since died, consequent on damage then sustained. The total number is 1761.

Another list was also placed on the table of 22 sorts of fruit trees that will be available to Members after the 15th of June next, when the distribution season recommences, amounting in all to 3116.

Read the following report from a section of the Committee (Messrs. Mosely and Agabeg,) on certain samples of Cotton recently submitted :—

1. Sample from the Dooar District, a harsh description of Country growth, fibres strong and of fair staple, suitable for the manufacture of coarse cloths.

2. Sample of cleaned Cotton raised in the Eta Jail from Egyptian seed, (Dr. Tyler,) inferior to original stock, but a very useful quality of fair staple and strength of fibre.

3. Sample of uncleaned Cotton, as No. 2. The bulk of this sample resembles N. O. stock more than Egyptian, the seeds being covered with tenaciously adhering fur, as usual in the former variety. A nice soft Cotton, of good color and length of staple. A small portion of this sample appears to be from Egyptian stock. The fibres readily separating from the seed, which is black.

4. Samples of Cotton from Jas. Powell, Esq., Roosa, Shajeehanpore, from N. O. seed. Good color, fair staple and fibre, and cleaned by Emery's Gin, shows to very decided advantage, as compared with sample cleaned by the Native Churka.

5. Sample of Country Cotton, as No. 4, cleaned by the Emery Gin, is the ordinary short staple, and a favorable specimen in point of color and general condition.

Letters were also submitted—

1. From the Under-Secretary, Government of Bengal, dated 25th April, forwarding a dispatch from the Secretary of State for India to the Governor-General of India, dated 24th October 1864, in respect to Agricultural Exhibitions in the Lower Provinces, and to a General Industrial Exhibition in Calcutta, in 1869-70, of which the following is a copy :—

"I have considered in Council your letter, dated the 29th of July, No. 43 of 1864, regarding the Agricultural Exhibition held at Alipore, in January last, and other propositions relating to that, or somewhat similar subjects.

"2. I have read with interest the account of the Exhibition at Alipore, the result of which, certainly may, on the whole, be deemed satisfactory; the number attending it (70,000), as well as the amount subscribed for extra Prizes by Native land-holders (Rupees 20,891), and the result of the sale of tickets (Rupees 40,394), proving the interest taken in the Exhibition by the Native population; and, considering the unexpected expense which the Committee found themselves called upon to undergo in the large arrangements and steam power required to be provided, you were justified in writing off to profit and loss the Rupees 30,000 out of the Rupees 50,000 advanced to the Committee.

"3. With regard to the proposition to expend a sum not exceeding Rupees 30,000 annually for the promotion of an Agricultural Show, in each of the ten Divisions of the Lower Provinces, I approve the limit of one year which you have placed upon the grant, and I hope that the suggestions you have made, as to the union of two or more of the Divisions for this purpose, may be adopted; as it would, besides diminishing the number of small Exhibitions, extend the circle for competition, and thus afford greater opportunity of judging of the advantages of cross breeding, and the adoption of measures in vogue in neighbouring Districts, leading up more effectually to the triennial Central Exhibition, which, it is proposed, to hold in Calcutta in 1867-68. Your Resolution, therefore, sanctioning an expenditure not exceeding Rupees 30,000 for one year on this account, has my approval.

"4. I approve also of your proposal to hold a General Industrial Exhibition at Calcutta in 1869-70, though it appears to me that the estimate of two lacs of Rupees for the Building, will be found very much below the sum which will be required for that purpose. I trust, however, that these Exhibitions may have the desired effect, and that the anticipations of the Lieutenant-Governor of Bengal with regard to their pecuniary results, may be realized.

"5. I shall be glad to have early intimation of the measures you propose for giving effect to this proposition, for the General Industrial Exhibition of 1869-70."

2. From the Under-Secretary Government of Bengal, dated 25th April, forwarding a correspondence connected with the recent Agricultural Exhibition held at Rajshaye.

3. From T. H. Mosley, Esq., enclosing letter from the Secretary Manchester Cotton Supply Association, in reference to the sample of "Indian Grass" received from Dr. Hunter, of Madras, and submitted at the Meeting in December last. "It is considered to resemble flax, though finer, and might possibly be used if it could be obtained at a very low price. Now, however, that cotton is more abundant, its value is very considerably diminished, and it would probably not be of much use for mixing with cotton."

4. From W. Haworth, Esq., dated 1st May, suggesting that, as he is about to visit England, it might be worth while for the Society to empower him to buy one of Scheel's new Cotton Gins, if, on inspection of its performance, he should consider it better adapted for our Indian small seed short staple cotton, than any that has yet come under the notice of the Society. Mr. Haworth adds, that from the drawings and description he has seen, he is inclined to believe it will be less costly for the work done, than any which has yet been submitted, and one great merit it appears to possess is its great simplicity.

Resolved—that Mr. Haworth's offer be thankfully accepted.

Friday, the 29th of June 1865.)

A. GROTE, ESQ., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The following Gentlemen were elected Members,—Messrs. Arthur D. Smart, E. Molony, C. S., T. C. Vertannes, A. N. Cole, and Geo. Keighley, Baboo Onootoop Chunder Mookerjee, the Secretary, Local Fund Committee, Goorgaon; the Secretary, Assam Company, Major H. T. Bartlett, Lieut.-Coll. J. R. Abbott, Lieut.-Coll. Goode, and Dr. R. F. Thompson.

The names of the following Gentlemen were submitted as candidates for election:—

Captain H. Waller, District Superintendent of Police, Monghyr,—proposed by Mr. W. Fitzpatrick, seconded by the Secretary.

The Commandant of the Deoleo Irregular Force,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Captain S. Chalmers, Dy. A. C. General, Cawnpore,—proposed by Captain C. T. Lane, seconded by the Secretary.

Captain G. R. Fenwick, Calcutta,—proposed by Mr. Joseph Agabeg, seconded by the Secretary.

Baboo Potit Paubun Sen, Calcutta,—proposed by Mr. Agabeg, seconded by Baboo Heralall Seal.

Captain F. G. Steuart, District Superintendent of Police, Raepore,—proposed by Captain W. Nembhard, seconded by the Secretary.

The Deputy Commissioner of Raepore,—proposed by Captain Nembhard, seconded by the Secretary.

H. Balfour, Esq., C. S., Calcutta,—proposed by Mr. Grote, seconded by Mr. F. Halsey.

Dr. H. N. Elton, Sealkote,—proposed by the Secretary, seconded by Mr. Grote.

Dr. J. Anderson, Curator, Imperial Museum, Calcutta,—proposed by Mr. Grote, seconded by Mr. Halsey.

Major Neil Boileau, D. J. A. G., Peshawur Division,—proposed by Major H. C. Johnstone, seconded by the Secretary.

Major A. W. Owen, Executive Engineer, Nowgong, Bundelkund,—proposed by Major W. S. Row, seconded by the Secretary.

Dr. M. R. Amesbury, 1st Bengal Cavalry, Nowgong, Bundelkund,—proposed by Major Row, seconded by the Secretary.

James Brander, Esq., E. B. Railway,—proposed by Dr. W. Cowan, seconded by the Secretary.

The Rev. F. Corbyn, Port Blair,—proposed by Mr. Grote, seconded by Lieut. R. C. Beavan.

John Gordon, Esq., Bank of Bengal,—proposed by Mr. Halsey, seconded by Mr. Grote.

Henry Krauss, Esq., Calcutta,—proposed by Mr. Halsey, seconded by Mr. Grote.

J. A. Wendle, Esq., C. E., Executive Engineer, Hidgelee Division,—proposed by Mr. T. W. Armstrong, seconded by the Secretary.

J. H. Johnston, Esq., Superintendent of Police, Hidgelee Division,—proposed by Mr. Armstrong, seconded by the Secretary.

The following contributions were announced :—

1. Selections from the Records, Government of Bengal, No. 41. Presented by the Government.

2 Journal of the Asiatic Society of Bengal, Parts 1 and 2, of Vol. 1, New Series. Presented by the Society.

3. On the Revision and Restoration of the Silk Worms, Part 11. By Captain T. Hutton. Presented by the Author.

4. Report on Cinchona cultivation and propagation in the Kangra Valley, Punjab. By Dr. W. N. Lees. Presented by the Government of Bengal.

6. A box of Orchids from Assam. Presented by W. J. Judge, Esq. These were, unfortunately, allowed to remain too long in the box, and were consequently much withered on receipt.

6. Seeds of the best Shiraz Tobacco. Presented by Dr. Hooker.

7. A few seeds of *Clianthus Dampierii.* Presented by Mr. H. J. Butler.

8. A few Orchids and Ferns from Nynee Tal. Presented by C. B. Wood, Esq.

9. 55 packets of acclimatized annual and other seeds from Lucknow. Presented by Mr. Hodges.

10. 4 packets of Seeds from Java. Presented by Mr. R. Scott.

11. Several kinds of hybridized Cotton Seed from Major Trevor Clarke. Received from Dr. Bonavia of Lucknow.—" I send you a packet of hybrid Cotton Seeds," writes Dr. Bonavia, " sent to me by Major Trevor Clarke from England. I would have sown them here, but, as those I send you are crossed with the Sea Island, which does not do up here, I shall feel much obliged if you will entrust them to some one who takes an interest in such experiments, and by and bye let me have an account of them, as the experiment is of some importance; each plot should be ticketed as the packets are. Major Trevor Clarke requires the following information, can you procure it from your numerous correspondents?

1. Does the pale spotless bloomed New Orlean's race ever produce seedlings with tubular yellow blossoms, spotted at the base as in the Sea Island, or *vice versâ ?*

2. Does the Bourbon vary in blossom, as to shape or color?

3. Do seedlings with brown wool occur in crops of white woolled sorts?

4. Is there a brown woolled sort with yellow spotted blossoms, (not being Indian)?

5. Is any sort known with pale widely expanded flowers and glabrous foliage?"

The Secretary mentioned that Mr. Grote and Mr. S. Jennings had kindly taken a few of these seeds for trial, and the residue had been sent to the Garden.

12. Four packages of Tobacco leaves raised in the Myan Oung District, British Burmah, from Rungpore seed, furnished last year by the Society. Forwarded for report by the Secretary of the Agricultural and Horticultural Society of Burmah.

The following memorandum affords some particulars regarding this Tobacco.—

With this Memo. are forwarded two parcels of Tobacco Leaves, containing as follows:—

Parcel No. 1.	Parcel No. 2.
1. Packet of Saptone.	
1. Do. of Septebarg.	1. Packet of Booreehaut, (planted late)
1. Do. of Booreehaut.	

The above are the produce of Rungpore seed. It was grown a few miles north of Myan Oung town, on the banks of the Irrawaddy.

The area planted from the seedlings raised from the seed supplied by the Chief Commissioner received from the Agricultural and Horticultural Society of India, was as follows—

1. Saptone $\frac{5}{192}$ Acres.
2. Septebarg $\frac{3}{192}$ „
3. Booreehaut $\frac{5}{192}$ „

Total $\frac{13}{192}$ Acres.

Or nearly 1-15 of an Acre.

The greater portion of the plants have been kept for seed, and their leaves therefore have not been plucked. It is supposed that the yield is about 280 lbs the Acre, and Tobacco is valued on the spot at Rs. 90 per 350lbs, or about three times the price of common Burmese Tobacco.

PRIZES FOR TEA ESSAYS.

Read the following Report from the Special Committee on Essays on the culture and manufacture of Tea, submitted to compete for the Society's Prizes:—

In accordance with the Resolution passed at the Monthly General Meeting of March last, your Committee have carefully perused the three Essays on the cultivation and manufacture of Tea in the Plains and the Hills, which have been submitted to compete for the Prizes offered by the Society, and beg to report as follows:—

"Of the two Essays from Darjeeling, we consider that of Mr. Muller to be the better. Though we think this good on the whole, and entitled to the Prize, as founded on his own personal experience, yet it would have been more acceptable had the writer bestowed greater care in the compilation generally.

In respect to the Essays from Cachar, it is to be regretted the writer's experience does not extend to Assam, so as to have enabled him to give his opinions on that district also. Setting aside the different treatment of seed and planting in Cachar, which is quite different from stake-planting in Assam, the general remarks are good, and the paper bears internal evidence of having been very carefully prepared. Though no other Essay has been sent in to compete with it, we consider the author well deserving of the Prize of Rs. 500, as his paper contains much practical information and is an useful contribution to our knowledge of Tea Cultivation and Manufacture in the district to which it refers.

CALCUTTA,
May, 1865.

WILLIAM MINTO.
WILLIAM HAWORTH.
W. U. EDDIS.

Resolved,—On the recommendation of the Council, that the Prizes of 500 Rupees be awarded to Messrs. Shipp and Muller, and that the Essays be published, with the least possible delay, in a supplementary number of the Journal. Agreed further that the useful paper, presented by Mr. Haworth, Jr., on the different descriptions of Teas known in the English market, with directions for packing them &c., be also published in the same number.

PARTICULARS RESPECTING THE GROWTH OF COTTON IN THE AMHERST DISTRICT.

Read a letter from the Secretary, Chief Commissioner of British Burmah forwarding the following Memorandum on the growth of Cotton in the Amherst District:—

The following information regarding Cotton exported from Moulmein has been derived from information afforded by Lieutenant-Colonel D. Brown, Deputy Commissioner of the District of Amherst.—

"The cotton exported from this district is chiefly grown on the bank of the Salween, from Wen-Kyan up to Shoay Goon. Its quality is admitted to be superior to any other cotton produced in Burmah. The deposit of silt, mixed with very fine sand, forms a rich light loam, which appears peculiarly well suited for cotton. The deposit is considerable every year. This arises from the silt being brought down from above, by the great incline of the bed of the River. Below Shoay Goon the incline is not so great, the current is consequently less rapid, and the water, during the rains, unable to find an exit towards the Sea by the Main Channel, especially when it is kept back by high tides in the South West Monsoon, overflows its banks and leaves behind it a rich deposit. Above Shoay Goon where the incline is considerable, and below Wen Kyan where the channels are wider, and there is less overflow, also from a greater portion of the silt having been dropped higher up, these localities do not present the same facilities for growing cotton as that between Shoay Goon and Wen Kyan,—a distance of about 30 miles. Cotton is grown in small quantities on the Gyne, Thoungyeen and Attaran Rivers, for home consumption. I have not been able to ascertain that any purchases for exportation have been made of cotton grown on those Rivers, nor of that grown in Thoungyas (hill plantations) by Karens living among the Hills to the Eastward of the District. The cotton on the Salween is grown by the Talines, Shans, Karens and Thoung Thoos living there.

2. "The cotton is *boná fide* indigenous, that is, it is of the variety usually grown in this Province. As far as can be learned, no foreign seed has been imported since our possession of the Country so as to affect the quality of cotton grown as an annual plant.

3. "It is sown in September or October—gathered in March and April. The produce per Acre is from 200 to 300 Viss of uncleaned cotton. It is cleaned by the ordinary Burmese Gin; 100 Viss of uncleaned, 30 to 35 Viss of cleaned cotton are obtained. One Viss contains 3·65lbs avoirdupois. The average yield per acre may be stated to be 100lbs. avoirdupois. The land yielding cotton pays a yearly rent of Rs. 1-4-0 per acre to Government. A reduction of this rate would not probably increase the cultivation.

4.* "With a Contract Law wisely framed, so as to protect the interests of capitalists, and their servants; with new rules for grants of waste lands to be given on far more liberal terms than they are present, I see no reason why, with the advantage of good soil and suitable climate, cotton and other products, should not be raised in this Province with equal facility and with profit, as elsewhere.

5. "It is believed that 5,000 to 10,000 acres of suitable land might be procured in addition to that now occupied. But the good land is scattered over a wide area.

6. "The area of land on both banks of the Salween, producing cotton in the season of 1864-1865, amounts to about one thousand acres, in addition to which a considerable quantity of land contains cotton plants, mixed with other products. This last amounts to 1,400 acres. If we estimate that one-half contains cotton plants, that will make a total of 1,700 acres of land under cotton cultivation on the Salween river. We can hardly estimate the produce as greater than 100lbs of clean cotton per acre, which gives a total of only 1,70,000lbs raised in the District."

(Sd.) A. P. PHAYRE,
Chief Commissioner of British Burmah.

FRUIT OF THE HILL BAMBOO.

The President submitted the following extract of a letter to his address, from Mr. W. Le F. Robinson, of Rungpore, in continuation of that read at the April Meeting:—

"It is about time I should report progress about the bamboo fruit which has turned out much what I expected; numbers of them kept falling off the trees, without any apparent change or reason, and I kept a lot for some time to see if any thing occurred, but as they merely shrivelled up externally, I opened some and found that the water in the centre gradually hardened into a white kernel. A good watch was kept on those on the trees, and the result is this,—as they get ripe, out of the *big* end *by* which they hang from the tree, springs a young bamboo leaf and *also* a bunch of roots; when the young shoot is some 6 inches long the whole thing drops off the tree, and apparently plants itself in the ground by the roots. I have got several planted out in boxes and they are growing famously so far, but I am not quite certain whether I should not stick them out into the garden and let them take their own chance. One that I planted 10 days ago, has shot up 15 or 16 inches, and thrown out 2 leaves, and if he goes on growing at the same rate, he will soon settle the question of transplantation to the garden for me. It seems a queer thing that the bamboo should reproduce itself on the tree without going to earth first; it flowers, seeds, fruits and the young plant grows out of the fruit, with fresh roots, before it leaves the parent stem. Is there any other tree or grass, I wonder, which does the same."

The President informed the Meeting, that he had heard from Rangoon, of a basket of Bamboo fruit having been carried into the Town from a Village 9 miles distant, and he was informed that Mr. Theobald, of the Geological Survey, who had just arrived in Calcutta, had brought up some specimens of the fruit which were doubtless those of *Bambusa baccifera*, a species described by Roxburgh, as inhabiting Chittagong and the Yumading Range. He had himself received specimens of the fruit of the Bamboo, 2 years ago, from Akyab, and he had sent his specimens for comparison to Mr. Theobald, who, he had hoped, would have attended the Meeting. He had little doubt that Mr. Robinson's Rungpore fruit would prove to belong to the same species.

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* Waste land on Salween River can be now purchased at the upset price of Rs. 2 and 3 per acre.

Letters were also read:—

From Under-Secretary, Government of Bengal, dated 15th May, forwarding copy of Dr. Anderson's Report on the destruction by the Cyclone to the Botanic Gardens.

From Dr. Cleghorn, dated Aden, 10th May, forwarding a paper for the Journal on the Timber procurable on the Indus, Swat, and Cabul Rivers.

From T. B. Bayley, Esq., Cape ot Good Hope, dated 27th June, to the address of the President, of which the following is an extract:—

"By first direct opportunity our Agricultural Society will send yours some Wheat and other seeds, the best we could obtain. These are *not* to be paid for by your Society, but if more are required in any quantity, they will be charged to the account of the Calcutta Agri-Horticultural Society. Our Secretary will send a letter of advice to yours, and the freight will be payable in Calcutta."

From Dr. G. Henderson, Secretary Agri-Horticultural Society of the Punjab, dated 4th June, in respect to acclimatized Cauliflower and Chinese Vegetable Tallow seed, (*Stillingia sebifera*). "We have a large quantity of acclimatized Cauliflower seed," writes Dr. Henderson, "which was very carefully collected, this seed produced very little the first season, not much inferior to imported seed, but the plants degenerated very much the second and third year. If you wish it, I will send you a small or large packet of this seed, it may do better in Calcutta than in this climate. You lately asked Dr. Stewart if we wanted any Tallow tree seed [from the supply of acclimatized Algerian seed presented by Mr. James Cowell]. The tree has been growing here well for ten years, and produces abundance of seeds, we have many thousands of plant of these, and can give you or any of your Correspondents fresh seed. The rains is the time to sow them."

The Secretary mentioned he had requested Dr. Henderson to send down the Cauliflower seed.

From Messrs. D. Landreth & Son, advising despatch of consignment of American Vegetable Seeds, *viâ* Liverpool per Ship *West*.

From Messrs. James Carter and Co., adivsing despatch of English Vegetable Seeds, per *Staffordshire*.

From Messrs. James Veitch & Co. advising despatch of trial assortment of Vegetable and Flower Seeds, per Steamer *Far East*.

The President, at the close of the Meeting, observed that the Rev. C. Parish, of Moulmein, had written to inform him of his having found the *Amherstia* wild on the Youzabeen River, in the course of an excursion which he had lately made to the Fir forests on the upper course of that River. He exhibited a Map, appended to a paper which Mr. Parish had transmitted to him for the Asiatic Society, and in which he had given particulars of his excursion.

Monthly Proceedings of the Society.

(Wednesday, the 26th July, 1865.)

A Grote, Esq., *President*, in the Chair.

The Proceedings of the last Meeting were read and confirmed.

The following Gentlemen were elected Members:—

Captain H. Waller, the Commandant of the Deolee Irregular Force, Captain S. Chalmers, Captain G. R. Fenwick, Baboo Pottit Pauben Sen, Captain F. G. Steuart, the Deputy Commissioner of Racpore; Dr. H. N. Elton, Dr. J. Anderson, Major Neil Boileau, Major A. W. Owen, Dr. M. R. Amesbury, the Reverend F. Corbyn, Messrs. H. Balfour, c. s., James Brander, John Gordon, Henry Krauss. J. A. Wendle, and J. H. Johnston.

The names of the following Gentlemen were submitted as candidates for election:—

The Hon'ble J. P. Norman, Judge of the High Court,—proposed by Mr. Grote, seconded by Dr. Tonnerre.

J. Mackillican, Esq., Merchant, Calcutta,—proposed by the Secretary, seconded by Mr. W. Minto.

Capt. H. Currie, 19th Hussars,—proposed by Major R. Richardson, seconded by the Secretary.

C. F. Carnac, Esq., c. s., Ghazeepore,—proposed by Mr. Grote, seconded by Dr. Tonnerre.

Major J. Y. Gowan, Bengal Staff Corps, Saugor,—proposed by the Secretary, seconded by Mr. S. Jennings.

J. Louis, Esq., Feridpore Silk Concern, Moorshedabad—proposed by Mr. D. T. Gordon, seconded by Mr. Jennings.

Dr. Richard Banbury, Superintendent of Jails, Hazareebaugh,—proposed by Major A. F. Baird, seconded by the Secretary.

H. B. Lawford, Esq., c. s., Jessore,—proposed by Mr. Grote, seconded by Mr. A. S. Sawers.

Captain J. C. Middleton, Superintendent of Police, Prome,—proposed by Captain E. J. L. Twynam, seconded by the Secretary.

C. W. Moore, Esq., c. s., Kirwee,—proposed by Mr. C. B. LeMessurier, seconded by Sir J. Wemyss, Bart.

A Lawrie, Esq., Merchant, Calcutta,—proposed by Mr. Minto, seconded by the Secretary.

F. Alexander, Esq., Merchant, Calcutta,—proposed by Mr. H. Knowles, seconded by M. S. P. Griffiths.

Dr. G. R. Ferris, Calcutta,—proposed by Mr. Joseph Agabeg, seconded by Mr. R. Blechynden.

J. G. Meugens, Esq., Calcutta,—proposed by Mr. Griffiths, seconded by Mr. E. G. Buskin.

The following contributions were announced:—

1. Report of the Bombay Chamber of Commerce, for the year 1863-64,—from the Chamber.

2. Report of the Bengal Chamber of Commerce, from March 1864 to April 1865,—from the Chamber.

3. Memoirs of the Geological Survey of India, *Palæontoligia Indica* 3-8,—from Professor Oldham.

4. Progress Report of Forest Administration in the Central Provinces for 1863-64,—from Government of India, Public Works Department.

6. Journal of the Asiatic Society of Bengal, Parts 1 and 2, of No. 2 of 1865, —from the Society.

6. Annual Report for 1863-64, of the Administration of the Bombay and Bengal Presidencies, of British Burmah, Province of Oude, and Straits' Settlements, —from the Government of Bengal.

7. Catalogue of Plants cultivated in the Royal Botanical Gardens, Calcutta, —from the Government of Bengal.

8. Journal of the Boston Society of Natural History, Nos. 2, 3, and 4, of vol. 7, and copies of their Proceedings,—from the Society.

9. Reports for 1861-62 of the Smithsonian Institution,—from the Institution.

10. Transactions of the Ohio State Agricultural Society for 1860-61,—from the Society.

11. Report of the United States Patent Office, *viz.*, Mechanics, vols. 1 and 2, of 1860; and vols. 1 and 2, of 1861; and Agriculture, 1861,—from the Patent Office.

12.. A varied collection of products from the Benares District, consisting of Cocoons and raw Silk, of wild silk yielders, Gums of various kinds, raw Cotton, Oils, Fibres, Dyes, &c.—presented by Baboo Peary Mohun Banerjee, Principal Officer of the Maharajah of Benares.

The Baboo submits a letter forwarding the above specimens, which embraces some interesting particulars respecting them, more especially in reference to the Silk, Cotton, Oils and Fibres.

The best thanks of the Meeting were accorded to the writer, and the samples were referred for report to their respective Committees.

13. Specimens of Cotton and domesticated Silk, raised at the Oude property of the Kumaon and Oude Company, and of Tea, from the Kumaon property of the same Company,—presented by Messrs. W. H. Smith, Barry & Co. Referred to the Committees for report.

14. A specimen of "China Grass" raised and prepared at Kangra. Forwarded for report and valuation by the Secretary of the Agricultural and Horticultural Society of the Punjab.

The Secretary mentioned he had submitted this small specimen to a Member of the Fibre Committee, Mr. William Stalkartt, who could not offer an opinion in respect to its value, but considered it to possess fair strength and good color, and might, probably, be suitable for fine fabrics. Mr. Stalkartt thinks it a mistake to attempt to prepare it in this Country beyond the raw state in which the "Rheea" of Assam is prepared.

The Secretary shewed, in connection with the above, some specimens of China Grass, in various stages of preparation, which had been given to him some years ago by Mr. Marshall, of Leeds, and which contrasted very favorably with that from the Punjab. Mr. Marshall informed him they preferred receiving it in the first stage of preparation, as all the subsequent stages could, he conceived, be carried on more economically and efficiently in England than in this Country. In this collection are included the Rheea fibre as prepared in Assam, valued in the English market at £60 to £70 per ton, and specimens, in subsequent states of preparation, the finest valued at £200 per ton, which, under the denomination of vegetable silk, can be substituted for mulberry silk for articles of clothing, at less than one-half the cost of the latter.

It was agreed to send the Punjab specimen to England, for a correct opinion on its quality and value.

15. Fruits of *Bambusa baccifera*, from the Arracan Hills,—presented by Mr. W. Theobald, *Jr.*

16. Plants raised from the same description of Bamboo from the Chittagong Hills,—presented by Mr. W. Minto.

(Full particulars regarding the above, will be found in the body of the Proceedings.)

17. Fruit of the same kind of Bamboo, from Akyab, sent to him in 1863 by Colonel Tickell.—Exhibited by Mr. Grote.

18. A small collection of Orchids, gathered in the vicinity of Calcutta,—presented by Mr. C. B. Wood.

19. A few seeds of a very handsome variety of *Hibiscus*, gathered in the Mahendro Mountains, 5,000 feet high, in the Ganjam District,—presented by Major W. G. Owen.

20. A plant of *Lonicera aureo reticulata* of Japan,—presented by Mr. Grote.

Mr. Grote also submitted, for inspection, a plant of *Arundina bambusifolia* in flower.

Major Wintle shewed some very fine flowers of double Zinnia, of various colors, raised in his garden at Dum Dum, from the seed presented to the Society by Mr. R. H. Smith, of Benares. The seed was sown on the 10th of June, and the plants commenced flowering in less than six weeks.

On the recommendation of the Council, the name of Mr. Samuel Jennings was submitted to fill the vacancy in their body, caused by the death of Mr. W. G. Rose. To be disposed of at next Meeting.

MUSEUM OF ECONOMIC BOTANY.

Read the following correspondence with the Government of India, in continuation of previous correspondence, in connection with the proposed Museum of Economic Botany:—

From A. H. BLECHYNDEN, ESQ., Secretary, Agricultural and Horticultural Society, to the Secretary to the Government of India, Home Department, dated 20th April, 1863.

Referring to the correspondence noted in the margin, I have now again the honor, by desire of the Council, to request the attention of the Government of India, to the suggestion contained in their first letter, for the establishment of a Museum of Economic Botany, in connection with the then proposed Imperial Museum.

2. The Council are disposed to renew the suggestion, as they understand that steps have now been taken towards the establishment of the Museum in question, and towards the appointment of competent Curators.

From Acting Secretary, Agricultural and Horticultural Society, dated 20th August 1862.

To Acting Secretary, Agricultural and Horticultural Society, dated 29th August 1862.

From Acting Secretary, Agricultural and Horticultural Society, dated 17th November 1863.

To Acting Secretary, Agricultural and Horticultural Society, dated 5th December 1863.

3. Referring to the 3rd para. of Mr. Acting Secretary Robinson's letter of the 17th November 1863, I have to add, that catalogues are now in course of preparation of the various samples of Fibres, Cotton, Silk, (wild and cultivated) Oils, Gums Resins, tanning substances, Woods, &c., which have been presented to the Society's Museum during the last quarter of a century, and that the Council will be glad to transfer duplicates or portions of the more interesting and useful of these specimens as a nucleus towards the suggested Museum of Economic Botany.

From ARTHUR HOWELL, ESQ., Under-Secretary to the Government of India, to A. H. BLECHYNDEN, ESQ., Secretary to the Agricultural and Horticultural Society, dated Simlah, the 4th July 1865.

I am directed to acknowledge the receipt of your letter, dated the 20th of April last, relative to the suggested establishment of a Museum of Economic Botany in connection with the proposed Imperial Museum, and in reply to inform you that after communication with the Managing Committee appointed to take charge of the Museum, the Governor-General in Council is of opinion that the measure must still further be deferred.

2. A copy of the correspondence is forwarded for the information of the A. & H. Society.

No. 1119, dated 31st May, to Secretary, Asiatic Society.

From Secretary Provisional Committee, dated 20th June.

From A. P. Howell, Esq., Under-Secretary to the Government of India, Home Department, to the Officiating Secretary to the Asiatic Society of Bengal,—No. 1119, dated Simla, the 31st May 1865.

From the Acting Secretary, Agi-Horticultural Society, dated 20th August 1862.
To the Acting Secretary, Agri-Horticultural Society, No. 4586, dated 29th August 1862.
From the Acting Secretary, Agri-Horticultural Society, dated 7th November 1863.
To the Government of Bengal, No. 7638, dated 5th December 1863.
From the Government of Bengal, No. 1454, dated 22nd March 1864.
From Secretary, Agri-Horticultural Society, dated 20th April 1865.

I am directed to transmit the accompanying copy of the correspondence noted on the margin, regarding a proposal made by the Agri-Horticultural Society for the establishment of a Museum of Economic Botany, in connection with the Imperial Museum, and to request that the Provisional Committee, appointed for the transfer of the collections of the Asiatic Society to the Imperial Museum, will be so good as to consider and report upon the proposal.

2. I am to add that the Governor-General in Council is disposed to think that the Museum is yet too much in embryo state to make it advisable to take in hand the proposed additional branch.

From John Anderson, Esq. Secretary to the Provisional Committee, to the Under-Secretary to the Government of India, Home Department, dated the 20th July 1865.

In answer to your No. 1119, I have the honor to inform you, that the Provisional Committee have considered the proposal made by the Agricultural and Horticultural Society for the establishment of a Museum of Economic Botany, and I am directed to inform you that the Committee concurs in the proposition that a Museum of Economic Botany be constituted, but is of opinion that the consideration of the details of the proposal had better be deferred, until after the trust shall have been legally founded.

Agricultural Exhibitions in Bengal.

Read the following letter to the Government of Bengal, in reference to a revision of Prize Lists for the Bengal Districts, and to other details connected with future Agricultural Exhibitions:—

From A. H. Blechynden, Secretary Agricultural Society, to the Hon'ble A. Eden, Secretary to the Government of Bengal.—dated Calcutta, July 20th, 1865.

I am desired by the Council of the Agricultural Society to request that you will convey to his Honor the Lieutenant-Governor of Bengal, the expression of their satisfaction at the success which has attended the institution of the several Local Agricultural Exhibitions, which have been held in the Mofussil during the past cold season. The complete success of the Central Exhibition, which was held in January 1864, at Alipore, afforded evidence of the interest which had been awakened in Agricultural pursuits, and did more to convince intelligent natives of what could be achieved in breeding Cattle, as well as what the resources of mechanical art could do for them, in the improvement of Agricultural implements.

2. The Council are glad to see that the Central Exhibition was followed up by the establishment of Local Exhibitions; for, by itself, it would have partially failed in its desired results, had it not been supplemented by the Local Shows, which have just now come to an end.

3. The Council cannot refrain from placing on record their sense of the benefits which have already, they believe, accrued, and will further accrue in time to come, to Agriculture in Lower Bengal by the wise policy which His Honor has adopted in thus following up the scheme of Agricultural Exhibitions throughout Bengal, whilst the spirit of enquiry was still alive, and before the people had had time to lapse again into apathy and unconcern.

4. Whilst recognising the advantages of these institutions, there are, in the opinion of the Council, some points in which a material improvement may be effected, as regards any future Shows which may be held, and they are, therefore, desirous of laying before His Honor the following suggestions :—

1st. The desirability of drawing up a well considered Prize List, for general adoption.

2nd. A more careful definition in such Lists of the objects for which the Prizes are offered.

3rd. The allotment of a considerable proportion of the Prizes given at such Shows, for competition by all-comers.

4th. That the recurrence of the Shows should be held at stated intervals, not less than 2 years elapsing between each Show in the same place.

5. As regards the adoption of the first suggestion, which is tantamount to having an uniform Prize List for all the Local Shows, the Council premise, that it will doubtless be readily acknowledged that the progress made in Agriculture and in improving the breed of Cattle in a District, will be more readily realised by the aid of an officially prescribed Prize List, than by leaving the drawing up of the List from time to time, to officials and residents of the District. There is no guarantee that in any of the Districts in which Agricultural Exhibitions have been held, the persons interested in and employed in carrying out such Shows, will be the same when the time comes for another to be held. New counsels, new ideas, and, perhaps new prejudices, may prevail in the Local Committee of a District, and, as a necessary consequence, the Prize List will, in so far as these new elements prevail, differ from the last. The grounds for arriving at any satisfactory comparison of the results of successive Shows will be gone.

6. Added to this, were an uniform Prize List to be adopted, not only would there be fair grounds of comparison as to the progress made by each District itself, but also of the progress made by one District when compared with another.

7. Nothing will show more readily the difference between the Prize List of the previous Shows, than an analysis of one division of each.

8. To commence with the Prize List of the Burdwan Show. Dept. I, Class I,—Cattle. There are 16 Prizes for the Bulls, *viz.*, 3 for the first 3 Bulls in the division list, and 2 Prizes for each of 6 Districts, and a single Prize open to all-

comers; the terms of the 16 Prizes are merely for the *best* Bull, without reference to age.

9. The Prize List of the Patna Division, for the Show held at Tirhoot, was a more extended List, owing to a larger amount of funds subscribed. But taking the List of the Divisional Prizes, which were given out of the Government money, (the same as at Burdwan), there are five Prizes for Bulls. Three for the best Bull, over 2 and under 5 years old, and 2 (1st and 2nd) for the best Bull, bred anywhere.

10. In the Prizes of each District of the Patna Division, there are two for Tirhoot proper, for Bulls over 2 and under 5 years old.

In the Patna District List there was no Prize for a Bull at all.

In the Shahabad District there were two Prizes, one for any Bull of purely Indian breed, bred in Sahabad; one for a Bull of any other breed, under the same terms,—no reference or restriction to age.

11. In the Chumparun District List there were two Prizes for Bulls.

12. In the Behar Zillah District List, 4 Prizes for Bulls, 2 for yearlings.

13. In the Chuprah District List, there was only one Prize for a Bull.

14. In the Bhaugulpore Division, there were only two Prizes for Bulls. One for the best bred in the Division, the other for the best bred out of the Division,—without limitation to age.

15. In the Rajshahye Division, there were sixteen Prizes for Bulls, and Bull Calves; the limits for age being in some cases over 1 and under 3; and in others, for Bulls of any age.

16. In the Dacca Division, there were 24 Prizes for Bulls; the competition being limited to over 2 and under 5 years old.

17. If the analysis is followed in the other sections and series of the Prize Lists, similar differences will be found even in them, though, perhaps, not to so great an extent as in the class which has been under notice. To go into these differences, in detail, would be merely a repetition, in a different shape, of the analysis which has just been under consideration.

18. The second point is one of some importance, *viz.*, that there should be a more careful definition of the objects for which the Prizes are offered; for instance at the Mozufferpore Show, in the Poultry Class, there were Prizes for Chittagong Fowls, and for Country-bred Fowls. The intention of the Committee was, that the Prize for Country-bred Fowls should be allotted to such Fowls as were exhibited for competition, in a list which were not qualified to compete for any of the Prizes allotted to Poultry, which were exhibited under the name of some specific breed such as Game, Chittagong, &c., &c. To their surprise, however, the Committee found a claim put in for Chittagong Fowls to compete under Country-breds, as well. There was a reference on the question, and the referees upheld the award, according to the intention of the Committee.

19. This difference of opinion between the Exhibitor and the Committee would not have arisen had there been a proper definition of what class of Poultry

were intended to compete as Country-bred Fowls. The same objection will, doubtless, be taken to apply to other Prizes, if the terms are carefully considered.

20 Thirdly, the allotment of a considerable portion of the Prizes given at each Show for competition to all-comers.

The Council are of opinion that this proviso is absolutely necessary to insure real vitality to local Exhibitions. If the Exhibition Committees of some Districts were thrown upon the resources of their own Districts, the result would be discouraging in the extreme. A District which produces no Cattle of any worth, should hold out inducements to the breeders of other Districts to exhibit specimens, which have some claim to excellence, and the right of which will do more to shew what good Cattle ought to be, than any amount of Prizes given to the best of the inferior breed of their own District. But to induce the inhabitants of other Districts to bring their good Cattle considerable distances for exhibition, the number of Prizes given to all comers-must be increased in the Local Shows. Again, the District Exhibitor who gains a Prize against all-comers in their own class, would feel much greater pleasure than if he only were the best of his own District. The all-comers' Prizes should be open in every class, not only to the outsiders, but the District Exhibitors.

21. The 4th point is one which appears to the Council to be deserving of great consideration, *viz.*, that the Local Shows should be held at such stated intervals, as to allow of not less than 2 years elapsing between each Show, in each District. This appears to be absolutely necessary to allow each District to have some rest. These Exhibitions are even yet a novelty to the Bengalee mind, and the object and scope are not, the Council are of opinion, as fully realised as they ought to be. Annual Exhibitions would not allow of sufficient time to improve successfully on the articles and live stock first exhibited.

22. In carrying out Local Exhibitions the Council would recommend that together with a uniform Prize List the details should be as uniform as possible. Entrance Tickets, Yard Tickets, Fodder Tickets, and those put over each animal or article in its appointed stall or place, should be of one uniform pattern. The Way Bills or Chullans, as well as the advices should be also uniform. These latter should be printed with a cheque margin; one part could be given as the Way Bill or Chullan, the centre portion despatched as the Advice, the cheque file retained as the Local Committee's voucher.

23. The Chullans should be posted on pieces of wood or card, so that they are not easily lost. Nor so dirtied as to be difficult to decipher. The advantage of this was seen at the Dacca Exhibition, when the Mymensingh Cattle and produce came in with their Chullans affixed to them. The person in charge of each shed had only to write on the Chullan the number of the stall or place allotted to it, and an official inside the shed at once located the animal or article of produce in its allotted place.

24 Uniformity in these petty details also carries with it economy. The setting up type is the dearest part of printing; when once the forms are agreed upon

the tickets can be printed in bulk, and the Local Committees could be supplied on indent from the Stationery Office, or other Department, which may have the custody of the same.

25. The Council would recommend that the opinion of the Local Officers be taken on this subject, and that after their opinions are taken, a Committee be formed for putting their views into practical shape.

In connection with the above, the Secretary submitted an interesting paper, with which he had been favored by Doctor David Scott, of Umballa, partly in reference to Mr. Halsey's communication published in the Proceedings of March last, and partly in respect to the breeding of Cattle generally. *(See body of the Journal).*

FURTHER PARTICULARS REGARDING THE HILL BAMBOO.

Read the following memoranda from Messrs. W. Theobald, *Jr.*, and Wm. Minto, respecting the Bamboo of which specimens (fruit and plant) have been already alluded to under the head of Contributions :—

" The fruit which I have the pleasure herewith of presenting to the Society, belongs to the *Bambusa baccifera* of the Arracan Hills, as I am informed by the Rev. C. Parish, at Moulmein, to whom I forwarded specimens a few months ago. The specimens forwarded by Col. Tickell, from Akyab, in 1863, appear to belong to the same species, and it is the common species of Bamboo over the greater portion of the hilly tracts of the Arracan Range. In 1864, the Bamboos were many of them commencing to fruit, but during the present year the fruiting has been unusual, and I have marched for miles over the Hills through Bamboo glades with these fruits dangling by twos and threes from myriads of Bamboos. They are attached by a short pedicle, or bunches of two or three, and at variable distances apart, all up the stem, but the new Bamboo has not usually more than 8 or 10, or even so many matured full sized fruit. The shape is somewhat reversed pyriform, with the apex beneath, and base somewhat tumid, but it varies considerably from roundish to elongate. On cutting one open, the embryo is found like a small beetel-nut, in size and shape, and this is very pleasant eating, being not at all austere, though without much flavor. The natives declare the whole is edible after baking, but I had not the curiosity to eat any myself. This Bamboo, from native testimony, fruits every thirty years or thereabouts, and the process appears to occupy a couple of years. This year, this species, which is the *Bamboo* of the Arracan Range, has fruited and flourished over the entire Range as far as my information extends, a phenomenon which it will be interesting to record accurately the recurrence of. The destribution of this Bamboo seems rather limited. It is perfectly well known to the inhabitants of the Arracan Range, but is unknown to the Karens and Burmese inhabiting the Pegu Range, east of the Irrawadi; and specimens shewn to them in Rangoon, excited their incredulous surprise when shown as fruit of a Bamboo, being so unlike the ordinary fruit of the Bamboo they were familiar with.

"This Bamboo is also propagated by underground roots, which run along beneath the surface, and yield curious solid walking sticks, though usually very crooked and unsymmetrical. The Bamboo itself is a small, light one, very much esteemed from its small size, lightness and strength, for fishing rods. Mr. Leeds at Rangoon, has a number of healthy seedlings, should any Members be desirous of procuring this species."

(Sd.) W. THEOBALD, *Jr.*

"The Bamboo seed I sent you a day or two ago, is from the Western Range of Hills on the Hulda, in the Chittagong District. I was employed with the Manager of an Estate there, examining a tract of land that had been partially cleared for Tea, consisting of heavy forest and Bamboo jungle. When I noticed the seed upon the ground, some of it had sprung and given out shoots. I asked the Jemadar, who was with me, about it, his version is this: the Bamboo flowers (*on the Hills only*) once in 30 or 35 years. The year the flower appears the Bamboo dies off, and where the Bamboo has been, there springs up a plant resembling a young Bamboo *in formation*, of a white color, growing to a height of from 3 to 5 feet. The stem is slender, not more than an inch in diameter. This was the plant from which I obtained the seed I brought up with me. This version was supported in every way by evidence on the spot.

"On each stem from 8 to 10 seed was got; as the seed had grown it had bent the stem down to the ground, and they were ripening in this way. As you will observe, they were throwing out suckers from the top or large end, even although not on the ground. I brought down about a bushel of seed with me, which I have planted out, and it is all coming up well. One of the seeds I put in a basket with some Tea seedlings, and it is now over 3 feet in height. The Jemadar also informed me that this would grow to a height of from 6 to 10 feet, giving large broad leaves and a rather slender stem; that, in the fall of the year, this would wither away, and next season the Bamboo would make its appearance in regular Bamboo form. I was anxious to ascertain if the flower on the Bamboo, which is something like millet, produced a seed; as this seed might have produced the plant in question, but the man could not explain this. I examined the roots of the plant, but did not find them to be in any way connected with the "tope," or rather, the roots of the former tope. I found them generally in a circle round the cluster, and I cannot account for this, unless the flower had contained a seed, and this had produced the plant.

"I notice Mr. Theobald states that he found the Bamboo seeds dangling from the Bamboos. Are the seeds sent by him different in size and form to those sent by me?

"I was conversing with a gentleman who had been surveying in Tipperah, and he informed me, that he had seen the seeds hanging from the trees. This is strange and would bear out that the bamboo produced seed in two different ways.

"If this is the case, then in the season in which the Bamboo flowers, it must also give seed from the stem, as stated by Mr. Theobald, and there can be no connexion whatever with the flowers. The appearance of the flower is the death of the Bamboo, for it dies the same season.

"There were hundreds of bushels lying about, and I instructed our Manager to plant out as many as he could. I may be able to report the difference between those planted on the Hills upon which they were grown, and those planted out here."

WM. MINTO.

The Secretary, at the close of the Meeting, drew attention to a note from Mr. Joseph Agabeg, in reference to a tree in his garden at Fairy Hall, Dum Dum, and from which he had recently submitted a few panicles of flowers. Mr. Agabeg states, he has been informed the tree in question is identical with that known in Penang as the "Senna," [*Pterocarpus Dalbergioides* ?] and which is indigenous to the Eastern Archipelago. "I think it is desirable to mention," remarks Mr. Agabeg, "that the tree in my garden is lofty and exceedingly handsome, and the flowers are very sweet scented." Mr. Agabeg, believing the tree to be not generally known in Calcutta and its vicinity, though so worthy of cultivation, is desirous of bringing it to the notice of the Society, and hopes to be able to furnish, in due course, a quantity of seed for distribution to Members.

(*Wednesday, the* 23*rd August*, 1865.)

A. GROTE, ESQ., President, *in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The following Gentlemen were elected Members :—

The Hon'ble J. P. Norman, Captain H. Currie, Messrs. J. Mackillican, C. F. Carnac, J. Louis, Major J. Y. Gowan, Dr. Richard Banbury, Captain J. C. Middleton, Messrs. H. B. Lawford, C. W. Moore, A. Lawrie, F. Alexander, J. G. Meugens, and Dr. G. R. Ferris.

The names of the following Gentlemen were submitted as Candidates for election :—

H. Richardson, Esq., C. S., Jessore,—proposed by the Secretary, seconded by Mr. C. E. Lance.

T. J. Phillips, Esq., Sylkooree, Cachar,—proposed by Mr. E. V. Westmacott, seconded by the Secretary.

J. Macmillan, Esq., C. E., Cuttack,—proposed by Mr. H. C. Levinge, seconded by the Secretary.

W. G. Deare, Esq., Deputy Magistrate, Magoorah,—proposed by Mr. Thos. Brae, seconded by Mr. S. Jennings.

C. H. S. Crosthwaite, Esq., C. S., Etah,—proposed by Dr. J. W. Tyler, seconded by the Secretary.

James Kimber, Esq., c. s., Midnapore,—proposed by Col. J. R. Abbott, seconded by the Secretary.

Robert McAlpine, Esq., Futtickcherry Estate, Chittagong,—proposed by Mr. W. Minto, seconded by Mr. R. Blechynden.

F. Baumgarten, Esq., Hulda Valley Estate, Chittagong,—proposed by Mr. Minto, seconded by Mr. Blechynden.

F. J. Cockburn, Esq., c. s., Sylhet,—proposed by the Hon'ble C. Steer, seconded by the Secretary.

C. Boulnois, Esq., 1st Judge, S. C. Court,—proposed by Mr. G. S. Fagan, seconded by the Secretary.

F. Lagarde, Esq., Silk Manufacturer, Berhampore,—proposed by the Secretary, seconded by Mr. A. Walker.

Geo. Grace, Esq., Sylkooree, Cachar,—proposed by Mr. E. V. Westmacott, seconded by Mr. Grote.

A. C. Wright, Esq., Deputy Magistrate, Jenidah,—proposed by Mr. W. Shirreff, seconded by the Secretary.

H. H. Fell, Esq., Bushuntpore, Jaunpore,—proposed by Mr. T. R. Grant, seconded by Mr. W. J. Judge.

A. W. Cosserat, Esq., Assistant Commissioner, Sonthall Pergunnahs,—proposed by Mr. M. T. Pearson, seconded by the Secretary.

Baboo Saroda Prosuno Mookerjee,—proposed by Baboo Ram Gopaul Ghose, seconded by Mr. Grote.

R. Sears, Esq., (Messrs. Burn & Co.),—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Baboo Gunendronauth Tagore, Zemindar,—proposed by Baboo R. C. Mittra seconded by Baboo Shibchunder Deb.

Captain G. T. Gough, 2nd Dragoon Guards, Muttra,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

The following contributions were announced:—

1. The Annals of Indian Administration, Parts 1 and 2, Vol. IX.,—from the Government of Bengal.

2. Memoirs of the Geological Survey of India Vol. IV. The Coal of Assam,—from Dr. Oldham.

3. Fourth Annual Report of the Agricultural and Horticultural Society of Oude,—from the Society.

4. Records of the Government of India, P. W. Department, No. 2, Progress Report of Forest Administration in British Burmah, 1863-64,—from the Government of India.

5. Seeds and a plant of *Œnothera longifolia*,—presented by Mr. Grote.

6. Plants of *Caladium Verschaffelli*, *C. argeyrites*, and *C. Houlettii*, and some plants of *Œrides affine*,—presented by Mr. S. Jennings.

7. Five plants and a quantity of cuttings of *Cissus discolor*,—presented by Captain John Patterson.

8. Plants and seed of *Pavonia rosea* and some Teak seed,—from Mr. John Scott, of the Botanic Garden.

9. A quantity of seed of Stone Pines, from the Gardens of J. Bateman, Esq., Sir P. Grey Egerton, and the Earl of Dudleigh,—from Mr. Errington.

10. A quantity of acclimatized Cauliflower seed from Lucknow,—from Dr. E. W. Bonavia.

11. A quantity of acclimatized Cauliflower seed from Lahore,—from Dr. Geo. Henderson.

12. Some acclimatized double Zinnia seed from Benares,—from Mr. R. H Smith.

13. Various samples of Tobacco, raised in British Burmah from Rungpore seed, received from the Society; forwarded for report by the Agri-Horticultural Society of Burmah. (Referred to the Committee.)

Mr. Grote submitted for inspection fine grown flowering plants of *Echites*—?, received from Mr. Rollison of Tooting, of *Solanun laciniatum* from Australia, and of *Dendrobium Kuhli* (?) or a nearly allied species,—from Upper Assam.

Mr. Jennings also submitted five kinds of *Caladium.*

The recommendation of the Council, submitted at the last Meeting, that Mr. Samuel Jennings be elected a Member of the Council, in the room of the late Mr. W. G. Rose, was brought forward, and unanimously agreed to.

Reports were read on certain samples of Cotton, Tea, and Silk Cocoons, which were submitted by Messrs. Smith, Barry & Co., at the last Meeting, as the produce of the Kumaon and Oude Company's Estate, in Oude and Kumaon.

Mr. T. H. Mosley remarks on the Cotton raised in Oude, as follows:—

"The small sample of Cotton you send me represents a very new quality, soft and silky, of good color were clean, fair staple and strength of fibre. From the appearance of the sample, however, I should say that the produce has been unusually small, and by no means carefully tended and gathered. The bolls are very poor and proportion of wool to seed but small. Home market value I estimate slightly under that of middling Orleans, say about 16½ per ℔."

Messrs. W. Moran & Co offer the following opinion on the mixed Tea produced at Kumaon:—

Good middling, bold black, well twisted and rather curly leaf with few yellowtips. Out-turn, greenish brown. Infusion rather pale and rather pungent with a slightly bitter flavor.

"The above Tea, which should be marked Pekoe-Souchong, has a very good appearance, the leaf being even and well manufactured, with a slight sprinkling of Pekoe, but the liquor has the rather disagreeable pecularity of being bitter and lacks the fulness which characterizes Assam and Cachar Teas. Its present value in London is 3*s.* 2*d.* to 3*s.* 4*d.* if in any quantity, or the equivalent—R. 1-4½ to R. 1-5½ in this market."

Mr. John Dacosta submits the following report on the Silk cocoons :—

" The samples of Oude Silk cocoons, you left with me this morning, appear to be equal to the best Bengal cocoons, but they are inferior to those produced in China, in size, in fullness, and in shape. By fulness, I mean the thickness of the coating of silk.

" As regards shape, the cocoons preferred in France and Italy are oval and well rounded at the ends, as they reel out more easily than pointed cocoons, like your samples.

" I enclose a few cocoons, produced in Italy, from seed obtained from Japan. They may be considered almost as model cocoons, and, on comparing them with your samples, you will see on what points the latter are deficient.

" It might be worth while to try Japan seed in this country.

In connection with Mr. Dacosta's recommendation, the Secretary read the following extract of a letter from Mr. F. Lagarde, Silk Manufacturer at Berhampore:—

" I hear from friends at home that the Japanese silk-worm seeds, imported in France and in Italy, have given very good results, especially in the latter country. Two species of seed were mostly imported, named in France, the one Trivoltin, and the other Bivoltin; the first one producing three crops, during the year, and the second one, two only. The cocoons of those species of worms are, it is said, much better than the yellow Bengal cocoons. In this country, where we have mulberry leaves at hand almost all the year round, I think that it would be of a great advantage to acclimatize the Japanese Trivoltin silk-worm. No doubt your means and influence are great, and I look to you to obtain a few ounces of Japanese silk-worm seed to experiment upon, and for which I should pay of course. Perhaps the experiment has already been done, if so, please let me know of it but if no one has tried it yet, I think it is a question worth being looked into."

The Secretary intimated that, in pursuance of a Resolution passed at a recent Meeting of the Council, he had taken steps to meet Mr. Lagarde's request.

Read the following letter from the Government of Bengal, regarding the distribution of Bulls, available at the Hissar Farm :—

From the SECRETARY to the Government of Bengal, to the Commissioner of the Patna Division, H. M. Y. Rotas, the 7th August 1865.

SIR,—I am directed to forward the accompanying copy of a communication from the Officiating Deputy Secretary to the Government of India in the Military Department, No. 343, dated the 17th ultimo, to the address of the Commissary-General, regarding the distribution of the Bulls available at the Hissar Farm, and to state that that Officer has this day been requested to inform you as to when you may expect the animals at Patna.

2. You are requested to receive charge of the Bulls on their arrival, to keep twelve of them for distribution in your division, to forward six of them under

proper care to the Commissioner of Bhaugulpore, and two to the Commissioner of Burdwan, advising them of their dispatch from Patna and probable time of arrival.

3. As regards the distribution of the Bulls in each division, I am desired to request that you will act generally according to the suggestions contained in your predecessor's letter, No. 229, dated the 2nd August 1864, disposing of the animals so as to ensure that they will be properly taken care of, and made generally useful without further expense to the Government. This may no doubt best be effected by making them over to English gentlemen engaged in agriculture, or in the management of landed property, some of whom have expressed a wish to have charge of them. But if there be any Native Zemindar of intelligence who is likely to take care of the animals and use them judiciously, the employment of such agency is desirable, or if the Collector or any Public Officer at the Sudder Station of any of the Districts is willing to take charge of a Bull he can be permitted to do so.

4. It should be understood that the Bulls are to be kept in one place and not to be moved about from village to village, and that each Bull will remain under the personal care of the gentleman who may be responsible for it. It is desirable that a fee should be taken for each Cow, but it should be small and should probably not exceed four or perhaps eight annas.

5. An annual report should be made on the 30th April of every year of the condition of each Bull, and a return of the number of Cows served during the year by each; an abstract of these returns being furnished to Government with your remarks as to the success of the experiment.

6. You are also to suggest to the Divisional Agricultural Committee, whether it would not be desirable at the Annual Shows to offer a Special Prize for the best stock bred from these Bulls.

No. 740.

Copy of the foregoing forwarded to the Secretary to the Agricultural and Horticultural Society for information.

Letters were also read—

1. From James Cowell, Esq., dated Brighton, 17th July.—"I am now in correspondence with Algiers," writes Mr. Cowell, "about a Cotton tree lately discovered in the interior of Africa, and called by the French "*Le Cotonner du Touat,*" which is said to attain the size of an Oak tree, and to last as long. Its production is considerable, of a very fine brilliant and strong Cotton, of a staple between the long and short varieties. The leaves of the tree are very thick, similar to the Fig and Mulberry, and the tree grows in the driest soil; and if I can procure any of the seed, I will send them to you; but as it has only just now been introduced into Algiera, where experiments are making and failing at various places owing, it is said, to the cold nights of Northern Africa, I may not soon be able to obtain any."

2. From Messrs. Vilmorin Andrieux & Co., of Paris, dated 11th July, intimating the reception of order for Rose trees to which they are giving their best attention.

3. From S. Jennings, Esq., enclosing letter from Mr. Paul, of Waltham Cross, in respect to the order for Rose plants which they have put in hand.

4. From Messrs. Law Somner & Co., Melbourne, dated 3rd June, enclosing invoice of Field Seeds.

(*Wednesday, the* 20*th September*, 1865.

A GROTE, ESQ., *President*, in the Chair.

The Proceedings of the last Meeting were read and confirmed.

The following Gentlemen were elected Members:—

Messrs. H. Richardson, C. S., T. J. Phillips, J. Macmillan, W. G. Deare, C. H. S. Crosthwaite, C. S., Jame sKimber, C. E., R. McAlpine, F. Baumgarten, F. J. Cockburn, C. S., C. Boulnois, Geo. Grace, A. C. Wright, H. H. Fell, A. W. Cosserat, R. Sears, Baboos Saroda Prosunno Mookerjee, and Gunendronath Tagore, and Captain G. T. Gough.

The names of the following Gentlemen were submitted as candidates for election.

R. Spankie, Esq., C. S., Jaunpore,—proposed by Mr. H. A. Harrison, seconded by the Secretary.

Captain Harvey Stanley Clarke, Superintendent of Police, Boolundshuhur,—proposed by Mr. F. Beaufort, seconded by Mr. Grote.

William Thomson, Esq., Calcutta,—proposed by the Secretary, seconded by Mr. S. P. Griffiths.

The Manager East India Tea Company, Assam,—proposed by Mr. R. Blechynden, seconded by Mr. S. H. Robinson.

Major A. K. Moffat,—proposed by Mr. J. H. Robinson, seconded by the Secretary.

Baboo Shibchunder Sircar, Zemindar, Beerbhoom,—proposed by Baboo Protap Narain Sing, seconded by Baboo P. C. Mittra.

E. F. T. Atkinson, Esq., C. S., Jaunpore,—proposed by Mr. H. A. Harrison, seconded by the Secretary.

Lieutenant Horace Spearman, Assistant Commissioner, Tenasserim Division,—proposed by Colonel D. Brown, seconded by Lieutenant R. C. Beavan.

A. J. Elliot, Esq., C. S., Tirhoot,—proposed by Major W. B. Irwin, seconded by Mr. H. Doveton.

C. P. Castle, Esq., Superintendent of Police, Jaunpore,—proposed by Mr. H. A. Harrison, seconded by the Secretary.

Superintendent Jorehaut Tea Company, Assam,
Manager Seebsaugor Tea Company, Assam,
Manager Typhook Factory, Assam,
Manager Dahingeapore Factory, Assam,
Superintendent of the Western Cachar Company, Cachar,
Manager Bowalea Factory, Cachar,
Manager Koeyah Factory, Cachar,
Manager Pallowbund Factory, Cachar,
Manager Goomrah Factory, Cachar,
Manager Narainpore Garden, Cachar,
Manager Jeypore Garden, Cachar,
Manager Lallong Garden, Cachar,
Manager Puttarea Garden, Cachar,
Manager Kallini Garden, Cachar,
Manager Dhubeedhur Garden, Cachar,
Manager Cutlee Cherra Garden, Cachar,

Proposed by Mr. D. Begg,
Seconded by Mr. S. Jennings.

Graham Peddie, Esq., District Engineer, E. I. Railway, Chunar,—proposed by Mr. C. B. Le Mesurier, seconded by Sir J. Wemyss, Bart.

Jean Dumaine, Esq., Monghyr,—proposed by Mr. J. F. Galiffe, seconded by Mr. Joseph Agabeg.

A. Boulderson, Esq., C. S., Moradabad,—proposed by the Secretary, seconded by Mr. Grote.

Manager Lower Assam Company,—proposed by Mr. S. Jennings, seconded by Mr. Grote.

James M. Wood, Esq., Tingri Mookh, Assam,—proposed by Mr. Jennings, seconded by Dr. Tonnerre.

J. D. Turnbull, Esq., C. S., Meerut,—proposed by Mr. Grote, seconded by Mr. A. S. Sawers.

J. W. Quinton, Esq., C. S., Seetapore, Oude,—proposed by Lieut. E. Woodcock, seconded by the Secretary.

Manager Moran Tea Company, Seebsaugor,—proposed by Mr. T. R. Grant, seconded by Mr. C. F. Burgett.

J. M. Lowis, Esq., C. S., Beerbhoom,—proposed by Mr. Grote, seconded by Mr. Griffiths.

Captain William Winson, Commanding 18th Native Infantry, Bhaugulpore,—proposed by the Secretary, seconded by Mr. Grote.

R. Manderson, Esq., C. S., Moradabad,—proposed by Mr. T. R. Grant, seconded by Mr. C. F. Burgett.

Dr. G. B. Hadow, Boolundshuhur,—proposed by Dr. T. Anderson, seconded by Dr. John Anderson.

Robert Turnbull, Esq., Calcutta,—proposed by Mr. H. Krauss, seconded by Mr. John Gordon.

The Health Officer, Calcutta,—proposed by Mr. Grote, seconded by Mr. Griffiths.

E. Broughton, Esq., Merchant, Calcutta,—proposed by Mr. Griffiths, seconded by Mr. M. Henderson.

E. C. Daniell, Esq., Calcutta,—proposed by Mr. Griffiths, seconded by Mr. A. G. Pendleton.

The following contributions were announced:—

1. The Journal of the Royal Asiatic Society of Great Britain and Ireland, Vol. 1, part 2, (New Series,)—presented by the Society.

2. A collection of Treaties, Engagements, &c., vol. vii.—presented by the Government of India.

3. Records in the Public Works Department, Nos. 3 and 5 (re-print,)—presented by the Government of India.

4. Agriculture and Agricultural Exhibitions in Bengal, presented by the Writer.

5. Plants of *Napoleana Imperialis*, and *Uraria crinita, var. macrostachya*,—presented by A. Grote, Esq

6. A few very fine ears of Maize raised at Darjeeling,—presented by John Muller Esq.

7. An unusually large specimen of "Jhinga" *(Lüffa acutangula,)* raised at Shatkirra (near Baraset) from Benares seed,—presented by Baboo Debnath Roy Chowdry.

8. A sample of cotton raised at Burrisaul from New Orleans Seed. Presented by C. E. Lance, Esq.

Mr. Mosley reports on this cotton as being a very favorable specimen of a most useful description. Value a little below that of American grown N. O. Colour good, and fibre of fair strength and length of staple.

Favourable reports from the Gardener were submitted on the trial germination of the English and Australian seeds. The trial assortment of flower seeds from Veitch of Chelsea is not favorable, very few having vegetated. The Secretary added that he had already received very favorable reports from the Punjab, Central India, Cuttack and other places respecting the English vegetable seeds.

Letters were read—

From the Secretary, Government of Bengal, submitting reports on proceedings connected with the Agricultural Exhibitions held in the early part of the year at Mozufferpore, Ranchee, Burdwan and Cuttack.

From the Assistant Commissioner, Sonthal Pergunahs, at Deoghur, requesting the aid of the Society in procuring for him a few bulls of good breed with the view of improving the breed of cattle in his division.

The Secretary stated he had referred Mr. Wilmot to the letter on this subject from the Government of Bengal, published in last month's proceedings.

From the Secretary P. & O. Company, London, acceding to the request of the Society for the concession of free freight, to the extent of one ton annually, for plants in lieu of seeds.

From Messrs. Guilfoyle and Son, Sydney, promising to send seeds of *Araucarias* in return for plants supplied by the Society.

The President submitted the following extracts of a letter to his address from Mr. Moore of the India Museum, and expressed the hope that some of the correspondents of the Society would aid in meeting Mr. Moore's wishes:—

"I much want moths and cocoons of the common Bengal silk worms, *viz*, the Dasee, Boropoloo, Madrassee or Nistry, and the small Chinese monthly, of none of which have I a specimen of the moth. You may therefore judge how thankful I shall be for them. These are intended for my forthcoming work on "silk producers and silk culture" which I have in an advanced stage of preparation, and should be glad if you have the power to obtain me a detailed account of the present condition of silk culture and manufacture in Bengal and Assam, or would induce some person, in the several Districts acquainted with the various branches, to draw up some such account.

"You wish to know what information I have from Bengal relating to honey bees. I am sorry to say I have none, and should be glad if you could supply me with such. Neither have I specimens from Bengal, and no nest from any part of India."

Mr. H. A. Shipp submitted for inspection a working size model of a Tea-rolling machine.

Mr. Gibbon also exhibited a model of his Tea-rolling machine, and explained the mode of working.

(Wednesday, the 25th October, 1865.)

A. Grote, Esq., *President, in the Chair.*

The Proceedings of the last Meeting were read and confirmed.

The following Gentlemen were elected Members:—

Messrs. R. Spankie, c. s.; William Thomson; E. F. T. Atkinson, c. s.; C. P. Castle; A. J. Elliot, c. s.; Captain H. S. Clarke; the Manager East India Tea Company, Assam; Major A. K. Moffat; Baboo Shib Chunder Sircar; Lieutenant H. Spearman; Superintendent Jorehaut Tea Company, Assam; Manager Seebsaugor Tea Company, Assam; Manager Typhook Factory, Assam; Manager Dahingeapore Factory, Assam; Superintendent Western Cachar Company; Manager Bowalea Factory, Cachar; Manager Koeyah Factory, Cachar; Manager Pallowbund Factory, Cachar; Manager Goomrah Factory, Cachar; Manager Harainpore Factory, Cachar; Manager Jeypore Garden, Cachar; Manager Jallong Garden, Cachar; Manager Puttarea Garden, Cachar; Manager Kallini Garden, Cachar; Manager Dabeedhur Garden, Cachar; Manager Cutlee Cherra Garden, Cachar; Messrs. G. Peddie; Jean Dumaine; A. Boulderson, c. s.; James M. Wood; J. D. Turnbull, c. s.; J. W. Quinton, c. s.; Manager Lower Assam Company; Manager Moran Tea Company; Captain Wm. Winson; Dr. G. B.

Hadow; Messrs. J. M. Lowis, c. s.; R. Manderson, c. s.; Robert Turnbull; E. Broughton; E. C. Daniell, and the Health Officer, Calcutta.

The names of the following Gentlemen were submitted as candidates for election:—

J. M. Courtney, Esq., Banker, Calcutta,—proposed by Mr. W. J. Judge, seconded by Mr. S. Jennings.

H. C. Bowser, Esq., Civil Surgeon, Dinagepore,—proposed by the Secretary seconded by Mr. Jennings.

C. F. Montressor, Esq., c. s., Burdwan,—proposed by Mr. Grote, seconded by Mr. A. Pigou.

Captain G. B. Fisher, District Superintendent of Police, Cuttack,—proposed by Mr. J. S. Armstrong, seconded by Mr. G. N. Barlow.

H. C. Eddey, Esq., Manager Deohull Tea Gardens, Debrooghur,—proposed by Mr. A. S. Campbell, seconded by the Secretary.

General Peter Jones, Simla,—proposed by Mr. A. S. Sawers, seconded by Mr. Grote.

F. A. B. Geneste, Esq., c. e., Phillour,—proposed by Dr. W. Cowan, seconded by the Secretary.

K. H. Mackinnon, Esq., Bicampore Factory, Tirhoot,—proposed by Mr. Jennings, seconded by Mr. A. Walker.

J. F. Ogilvy, Esq., Merchant, Calcutta,—proposed by Mr. S. P. Griffiths, seconded by Mr. Geo. Ruxton.

Robert Park, Esq., Indigo Planter, Bhaugulpore,—proposed by Mr. Thomas Grant, seconded by Mr. P. T. Onraet.

Joseph Dacosta, Esq., Pleader, Civil Court, Bhaugulpore,—proposed by Mr. Grant, seconded by Mr. Onraet.

Captain A. Tulloch, District Superintendent of Police, Rungpore,—proposed by Mr. J. Stephens, seconded by the Secretary.

Donald Clunes Gordon, Esq., Merchant, Calcutta,—proposed by Major W. N. Lees, seconded by Mr. Grote.

Superintendent of the Queen's Gardens, Delhi,—proposed by Dr. Tonnerre, seconded by Mr. Jennings.

Dr. J. McLeod Cameron, Civil Surgeon, Monghyr,—proposed by Mr. J. Mackillican, seconded by the Secretary.

Colonel A. E. V. Ponsonby, Commanding H. M. 12th Regiment, Seetapore, Oude,—proposed by Lieutenant E. M. Woodcock, seconded by the Secretary.

Baboo Prannath Chatterjee, Calcutta,—proposed by Baboo P. C. Mittrar, seconded by Baboo S. C. Deb.

F. Greenhill Esq., v. s., Calcutta,—proposed by Mr. Griffiths, seconded by Mr. J. A. Crawford.

Major H. B. A. Poulton, Bengal Staff Corps, Saugor,—proposed by Major J. Y. Gowan, seconded by the Secretary.

P. A. Humphrey, Esq., c. s., Rampore Beauleah,—proposed by Mr. T. F. Kilby, seconded by Mr. S. H. Robinson.

T. E. Ravenshaw, Esq., c. s., Cuttack,—proposed by Mr. N. Shore, seconded by the Secretary.

Superintendent Northern Assam Tea Company,—proposed by Mr. Griffiths, seconded by Mr. D. T. Shaw.

Clement Wingrove, Esq., Tea Planter, Debrooghur,—proposed by Griffiths, seconded by Mr. Shaw.

The following contributions were announced:—

1. Political Missions to Bhootan,—by the Government of Bengal.

2. Report of the Sub-Committee of the A. & H. S. of Madras, in reference to the improvement and extension of Cotton culture,—by the Society.

3. Memoirs of Geological Survey of India, Vol. V. Part 1, and of *Palæontologia Indica*, 3-9, and Annual Report for 1864-65,—by Dr. Oldham.

4. Journal of the Asiatic Society of Bengal, Part 1, No. 3, and Part 2, No. 3,—by the Society.

5. Two plants and some berries of a wild Coffee from Chittagong,—received from W. G. Young, Esq.

The following is a letter from Mr. Sarson, Deputy Collector, to Mr. Young, regarding this Coffee:—

"I have much pleasure in sending you a plant of the wild Coffee and a few ripe berries I have found growing on the Hill to the west of the Station. The natives call it 'jungly Coffee.'

"It appears there is another species growing more abundantly all over the District, which the natives call Hareena. It grows to the height of 10 or 12 feet. The wood of it is used by the natives for posts of houses, and specially for the centre pole of their ploughs,—it being very hard and tough, and well adapted for such a purpose. The leaf and branches of it are very like the home grown Coffee, but the fruit of it does not come so near the real Coffee as the jungly Coffee. I am sorry I have no berries of this kind to send you, but I send a plant of it, in a separate pot.

"I sent a man out to see if he could find the jungly Coffee on any other Hills, and he came back and reported that he could not, and added, that the Hills just now are so densely covered with jungle, that he could not penetrate into them; so I have yet hopes that it will be found in other parts of the District too.

"The plant, I now send, was found growing at the bottom of the Hill, and there are hundreds of plants to be found at the same place. At the roots of the old plants are scores of seedlings. You will observe a couple of them in the same pot with the old plant. The berries turn purple when ripe, and are destroyed by birds in the same way as the home Coffee.

"The old plants seem to have been much eaten down by Cattle, and are just now covered with jungle, otherwise, I think they would have shewn good laterals. I am given to understand, that an old woman, about 10 years ago, used to gather these berries and sell them in the Bazaar at four annas a seer.

"If you think it worth while, perhaps, you will send these plants and berries to the Horticultural Society to report upon. When the berries are ripe, which will be in another month or so, I shall be happy to send more, if needed."

In reference to the above, the Secretary placed on the table a sample of Coffee very similar to Mr. Sarson's, sent to the Society upwards of 20 years ago by Mr. Sconce, the then Collector of Chittagong. The plant ("jungly coffee") is probably *Coffea Bengalensis*, which is common in various parts of Bengal.

6. Samples of fibres from certain Malvaceous and Liliaceous plants, prepared at Benares,—presented by Baboo Peary Mohun Mookerjee.

A Report was read from a section of the Committee (Mr. Joseph Agabeg and Baboo Peary Chand Mittra,) on certain samples of Tobacco raised on the Myaon-Oung District, in British Burmah, from Rungpore seed supplied by the Society. These samples were forwarded through the local Agricultural and Horticultural Society, and submitted at the June Meeting. The Committee report that Nos. 1 and 2 are the best of the four samples, and are very much about the standard of Tobacco sent from Burmah raised from Rungpore seed, and are very well adapted for ordinary Cigars. Nos. 3 and 4 are not so good.

The Gardener submitted a list of grafts and layers of fruit and ornamental plants, made from June to September, shewing 4,886 of the former, and 2,321 of the latter. Mr. Errington reports the trial assortment of Flower seeds received from Messrs. Veitch of Chelsea, to be failures.

COTTON CLEANING MACHINERY.

Read a letter from Mr. William Haworth, dated Lancashire, 2nd September, in reference to the "Schiell's Patent Knife Roller Gin," (respecting which he was requested to make enquiries, as by a resolution passed at the Monthly Meeting in May last,) and to certain other Cotton Cleaning Machinery. The following is extract of Mr. Haworth's letter:—

"I duly received your note of the 22nd June, but the samples of "Cotton Kuppass," did not get to me until last week, having been mislaid in the P. and O. Co.'s office in London. After I got your note, I was in the Dublin Exhibition, and there saw a Cotton Gin at work on "Schiell's Patent" made by Dobson and Barlow of Bolton, who also exhibited a double-cylinder Saw Gin, patented by themselves. They had been furnished by the Indian Government through Dr. Forbes Watson, with a bale of E. I. Cotton, also a bag of an inferior kind. The best was (as far as I could judge) grown from New Orleans seed, but not equal to original stock in length of staple or in condition. I saw this tried on three kinds of Gins first on Macarthy's 40-inch. wide driven by steam, the Kuppass were not at all opened and rather damp, the work was fairly done, but it *was slow*, and turned out very little, requiring the *active* attention of one man to keep the roller evenly fixed. I did not form a higher opinion of this Machine on this occasion than when we tried it in your rooms some time ago. Nor do I think it well adopted for our Indian *short* staple Cotton.

"I then had Schiell's new Patent Gin tried on the same Cotton, it is difficult to describe the action, and I enclose you a printed paper, being a leaf out of the official description of the Machinery in motion, Dublin Exhibition, which gives you the particulars of all the three Gins shown. The performance of Schiell's on the same Cotton is far in advance of Macarthy's, and for *medium* and *long staple* Cotton I consider it by far the *most simple*, and efficient of any Gin I have yet seen, but for *short staple*, like all other knife and roller Gins, it is wanting though better even for this sort than most I have seen.

"The Gin that comes nearest to perfection for short staple is Dobson and Barlow's, and stands No. 1 on the enclosed paper, which gives a good description of it; the width is the same as the Schiell's Gin, it runs at great speed, and turns out the work beautifully; the same Cotton was used as in the other Gins, nearly every seed was denuded of all its Cotton, which was sent out very clean and free from sand, dust, &c.; and yet not injured in the least, as regards cutting the staple; it gets through a large quantity in a short time.

"On my return from Dublin, I took over to Bolton, to Dobson and Barlow's Works, samples of Cotton, to try Schiell's Gin there. You do not say what Cotton the three parcels were, further than that they were grown near Calcutta; one was a very white well grown Cotton, like some of the Burmah kinds and unlike Bengal, the staple short but requiring great force to separate it from the seed. The other was *ill* grown, bad condition, Bengal common kuppass; this I tried first, the machine did its work well, but a very large quantity of *small* and immature seed was cut or passed through broken up, leaving a very dirty sample of Cotton; it is only fair to state, that this was as much or more owing to the condition of the kuppass than to any fault in the machine; the machine could be adjusted to work well on such cotton had my samples been large enough for a second trial.

"I then tried the Burmah like Cotton Kuppass, and on these the machine did its work exceedingly well, separating and cleaning the seed well, and leaving a very good clean sample of Cotton, it could not be better done; but, in consequence of the Cotton adhering to the seed so firmly the work was slow, and, I am convinced, the Saw Gin would have done it quite as well at four times the speed with the same power.

"I do not think we shall ever get a satisfactory hand machine for Ryots' use. Again, I would venture the opinion that, for large machines to be worked by cattle, steam, or other power, *this double* Cylinder Saw Gin of Dobson and Barlow's is far the most efficient for *short staple*; and for *long staple* to be worked in the same way *Schiell's* is by far the most simple and the best of Roller Knife kind.

I am to be furnished with more particulars of the cost of each, which I will send to you. I think the Society should have one of Schiell's in their Museum."

The following are extracts relative to Dobson and Barlow's Saw Gin, and Scheill's Knife Roller Gin, taken from the printed paper, referred to by, and enclosed in, Mr. Haworth's letter:—

"A double-cylinder Saw Gin, with thirty saws to each cylinder. The novel features in this machine are, that it is equal to two machines combined in one, and capable of doing double the work of ordinary single cylinder gins, whilst only occupying the same space, and only one main driving belt being needed. Another improvement consist in the application of a fan, with down draft; and two perforated zinc cylinders, and an elevated delivery creeper; by this arrangement the users of these machines are enabled to deliver the Cotton in the same room without annoyance—thus preventing waste of Cotton, and promoting the health of the work-people, by keeping the room clear of noxious dust, and delivering the Cotton in a cleaner condition by means of the fan and the perforated cylinders. It is also fire-proof.

"The action of the machine is as follows:—One of the sets of saws is placed above the other, both projecting through a single polished grate; this grate is attached to a "hopper," into which the seed Cotton is placed; and when a sufficient quantity of Cotton is put in, it commences to rotate in the form of a roll, in the opposite direction to that of the saws, thus continuously presenting fresh surfaces of fibre to the needle points of the saws, which convey the cotton fibres through the grate, leaving the seeds behind.

"A cylindrical brush is placed behind the saws, which revolves at a rapid rate; this brush clears the Cotton fibre from the saw teeth, and delivers it on to the surfaces of two perforated cylinders, whilst through the partial vacuum caused by the fan, the dust and small leaf passes through both cylinders to the fan, which delivers it in any desired direction. The clean Cotton then passes between the "cages" on to an elevated delivering creeper or lattice, and from thence falls off in the form of a fleece. When the seeds are completely stripped of their fibre, they pass through a grating attached to the lowest part of the hopper into any suitable receptacle.

"This machine being constructed of iron, wherever practicable, is especially adapted for hot or variable climates."

"A "Knife Roller Gin."—This gin is not thus named because it has merely a knife and a roller, but it is from the peculiarity of the shape and action of that part of the machine which turns over the seeds, whilst the cotton fibre is held between the leathered surface of a wooden roller and the steel surface of a doctor knife.

"Description of the machine:—It consists of a wooden roller, 30 inches long; this roller is covered with seahorse or other leather, and measures five inches diameter outside the leather when turned true. There is a steel doctor knife, as in the Macarthy Gin, which is pressed against the leathered roller, and the cotton fibre is drawn in between them, as in the last named gin. In front of the doctor knife is another roller, from which this kind of gin derives its name, *viz.*, a "knife roller;" it consists of a shaft, about two inches in diameter, upon which are threaded a number of thin discs of iron or steel; these discs are fixed on the shaft in a direction diagonal to its axis; and although the discs appear to be oval in shape, the periphery of the knives run perfectly true; or, in other words, the knife roller would fit a true bored cylinder of the same diameter These two rollers are geared together by suitable wheels, the relative speeds of which are about as 4 to 1. The object of the knife roller is to turn over the seeds in front of the doctor knife, first in one direction, and then in the other, both laterally and diagonally until the whole of the fibre is taken off; and not only so, but it keeps presenting again and again fresh surfaces of the fibre to the action of the doctor and leathered roller so long as it has any cotton to work. Under the knife roller is a wire grating, through which the cleansed seeds pass when stripped to their fibre.

" The principal points of novelty in this machine are :—First, its simplicity as a roller gin—that is, one in which the cotton fibre is licked in between the surface of a leathered roller and a steel knife or doctor; it has no vibrating knife; no wood connecting rods, or joint for same; no radius rods or socking shafts; no crank shafts or pedestals for same; all of which are to be found in the "Macarthy" Gin.

" Secondly, it is the only effectual self-feeding roller gin hitherto produced.

" Thirdly, the wearing parts are fewer in number, thus requiring less attention and less oil to keep them in order.

" Fourthly, the production is considerably greater, in proportion to the breadth of the roller, than on any other kind of roller gin; for instance, sixty 30-inch "Knife Roller Gins" will produce as much or more than one hundred 40-inch "Macarthy Gins."

" Fifthly, economy of room—say, for example, a 30-inch knife roller gin will occupy 3 superficial feet less room than a 40-inch "Macarthy."

" Sixthly, economy of labour. 10 persons can attend to 60 knife roller gins, or 1 person to 6 gins.

" Lastly, economy of power; as fewer gins will be required to produce the same, or, a better result, it is evident there will be a saving in the cost of the power employed; and not the least feature in this respect is, that the mill gearing or shafting will do if run at a much slower speed than has hitherto been the case."

Resolved.—That no further action be taken in respect to the ordering of these Machines, till the receipt of the full particular of costs promised by Mr. Haworth.

SHEEP FARMING IN DARJEELING.

Read a letter from Mr. R. W. King, District Superintendent of Police, respecting the Ong-Ti. breed of Sheep, and their introduction on the Darjeeling Hills.

Mr. King's letter, of which the following is an extract, is dated from Darjeeling, 2nd October:—

"Probably you do not often see Australian Papers, so I send you an extract from the *Sydney Herald*, about a new species of Sheep.

"Were there a rail-road between this and Calcutta, (which there must be some day,) I believe that Sheep farming will pay up here as well as, if not better, than Tea, of course supposing that Government will sell their land.

"From what I have as yet seen of the indigenous breeds of Sheep, they are coarse both in wool and flesh, (the mutton is very indifferent) but, I have little doubt, that by importing fresh blood from other countries (these Ong-Ti Sheep to begin with) these Hills would produce both mutton and wool equal to any country in the world.

"There will be some magnificent land for Sheep farming between the Teesta and Delimkote, as soon as the boundaries are laid down. Many hundreds of acres of gently sloping land, which is now covered with light jungle, and which might be cleared (burnt in New Zealand fashion), and sown down with English Grass Seeds, (perenial Rye Grass, sweet Vernal, and Cocksfoot Grass), would answer well for an experimental farm, say, at first, about 2,000 acres might be cleared.

"You will see on perusal that these Ong-Ti Sheep do not suffer from foot rot, which is the only disease that I should dread in this damp climate; if they answered, the Merino might be tried; these could be easily got from Australia, also English breeds from home.

"The expense of such an experimental farm once started, could not be great. A Superintendent and four English Shepherds, (good shearers) with the assistance of a dozen Lepchas would suffice. Even if it should not succeed, Government would not lose much, if anything, as the sale of the cleared land and the stock would, I think, well cover the outlay. It would be something to teach the Hill men to shear, at present they pull the wool."

The following is the extract from the *Sidney Herald*, referred to by Mr. King:—

"The *Age* of Thursday reports as follows:—A private meeting of squatters was held at Scott's Hotel, yesterday afternoon, for the purpose of considering the advisability of introducing the *Ong-Ti breed of sheep*, from Chinese Tartary, into this colony. Mr. H. E. Michel, of the firm of Michel and Toller, Collins-street West, stated the purport of the meeting to be the formation of a Company, registered under the Limited Liability Act. The Ong-Ti breed of sheep are natives of the *north-west provinces of the Chinese Empire* They are found to the north-west of Pekin, outside the great wall, in the neighbourhood of Shanghai, in 41' north latituded 114' east longitude, and also in the In-Chin mountains. They are, therefore, considered specially adapted for acclimatisation in the colder parts of Australia, and fitted to thrive in localities which are unadapted to existing breeds. It is proposed to introduce this sheep into Australia, and by judicious crossing with the native breed, it is believed an animal would be produced combining the weight of carcass and prolific qualities of the Ong-Ti with the finer texture of the wool of the Australian breeds, which, from its great length of staple, would render it peculiarly adapted for *combing purposes*. The Ong-Ti sheep are very prolific, breeding twice a year, averaging three lambs at a birth The carcass of the wether weighs about 147lbs., and the quality of the mutton is equal to the best Leicester. Their average height is 3 feet 3 inches. An attempt has been made to introduce sheep from China into these colonies, called the Shi-Si, but they are of an inferior quality to the *Ong-Ti*. The latter came from a totally different part of the empire, full a thousand miles distant from the locality where the Shi-Si is obtained. The wool of the Shi-Si has been classed at Bradford at 1*s*. per lb. whilst the Ong-Ti. which is not inferior in quality, is four inches longer in the staple. It has been ascertained that not less than six millions of these sheep annually pass through the northern gates of the great wall of China, to supply northern Chinese markets; and even there manufactories are in operation to *convert the wool of the sheep into fabric* for the distant interior of Asia. An important peculiarity of these sheep is their immunity from foot-rot. On this point, a letter from Mr. John Ross, of Maitland, is important, as he has experienced their qualities. He writes—"We have but one imported, and that one a ram. The first cross with large-farmed German ewes produces good butchers' sheep, the lambs, at four months, weighing thirty-five to forty-five pounds, and sell readily. The wool from these is of small value and the fleeces light. The second cross, both as regards wool and carcass, is far superior to the first, and is productive of a very hardy sheep. Last year was a very wet one. As you may remember, most of our sheep on this flat country are lame from February till November; but these, the second cross, did not appear to suffer at all. I don't think we had to pare the feet of one of them. They come to maturity very early. I sent four of them to the Maitland Show last April; they had two teeth up only, and one of them weighed 177lbs. gross; none were under 140lbs. They were not artificially fed. * * * As to the Chinese ewes having four teats, I do not believe it; none of my cross have four." Other evidence, from firms of respectability in Sydney, and from Chinese merchants of probity, proves the advantages to be derived from the importation of this breed of sheep. Specimens of the wool were exhibited, and correspondence read in support of the statement made by Mr. Michel. The names of a number of gentlemen, resident in Sydney and Queensland, who have undertaken to become shareholders, were read; and a list of Victorian firms submitted who have expressed a willingness to join the undertaking as soon as the Company has been initiated."

Letters were also read:—

From T. B. Bayley, Esq., from Wynberg, South Africa, dated 14th August, in respect to the wheat seed promised some time ago, and applying for Tobacco seed and "Mountain Rice." Mr. Bayley also offers a few remarks regarding sheep.—

"The wheat and other seeds for the Agricultural Society of Calcutta have been lying ready for shipment for about 4 months. Two Steamers, bound to Calcutta, refused to take them, and our only hope is the *St. Lawrence.* If she does not come here this year we shall be *lachar,* as it is, the seeds so long packed may be seriously injured before they reach Calcutta, but it is not *our* fault. *Some more Tobacco seed from your Society will be acceptable.* We expect a very good Show in Cape Town next November, and I will send you a Prospectus. It may be useful as affording some hints for your next Show in Calcutta. Our wool farmers are taking to the Coltswold and Lincoln cross with the Merinoes, wherever the pasturage is suitable, long wool being much sought after in England. Breda is trying it with every prospect of success. But I fear the wool growers of the Cape must look for reduced prices in future. The supply for South America and other quarters is increasing so rapidly, that it will exceed the demand before long.

" Besides Wool and Copper we have no other exports. The price of land is about half of what it was 6 years ago. The Eastern Province is almost wholly insolvent, and there is no sale for any thing in East or West.

" Rice is getting up to an enormous price here, I am told it cannot be sold to a profit under 35*s* per bag, when 15 used to be the price. I believe the Mountain Rice of India could do here, and perhaps, you can get some for us. Ten maunds would not be too much, and it could come by the *St. Lawrence.* Some instructions as to its treatment will be desirable, with regard to soil, manure, &c., &c."

The Secretary stated that the Mountain Rice alluded to by Mr. Bayley, is probably identical with the Joomla paddy of Nepaul, of which full particulars are published in the earlier volumes of the Society's Transactions. He had placed himself in communication with the Residency Surgeon at Katamandoo on the subject, and would furnish Mr. Bayley with the required instructions.

2. From Dr. George Henderson, Lahore, dated 29th September, on certain Horticultural items of interest. The following is extract of the letter :—

" I have to thank you very much for your promise of American seeds in return for the Cauliflower seed I sent you. All the Cabbage-tribe seed freely in the Punjab, but the acclimatised seed does not produce very good vegetables as a rule. I had often observed, however, that the natives manage to grow first-rate Cauliflower from acclimatised seed, and only the other day our Gardener, Mr. Freeman, found out the reason why. The Natives say that the seed improves by being kept for two years, and possibly if kept for a longer time, would still further improve. I can easily imagine that there is something in this, for Balsam seed will not produce plants with double flowers unless kept for 8 or 9 years. I will send you some more of our Cauliflower seed to enable you to test the effect of keeping it, and, I think, it would be well to try the effect of keeping it for at least five years.

" With regard to Balsams, I may mention, that I have lately been propagating them by cuttings most successfully, as recommended in Ferminger's book on Gardening. I have a collection of the finest double Balsams I have ever seen ;

they were raised from seed got direct from Carter; cuttings taken just as the plant came into flower, and put in stand, kept constantly wet, produce in four days roots ¼ inch long; if the plants are in full flower 8 or 10 days are required to root the cuttings.

"Veitch's seed was a complete failure. English Seedsmen should try some artifical means of drying their seeds sent to India. I lately got a lot of Australian seeds, which have germinated very freely, they were sent in two fir boxes one within the other with an inch of clear space between. There was no tin case."

3. From R. W. King, Esq., dated 10th October, requesting the aid of the Society in obtaining Potatoes from Van Dieman's Land:—

"It is a well known fact," observes Mr. King, "that for some years the Darjeeling Potatoes have been deteriorating in quality, this, I think, arises a good deal from the want of a change of seed.

"The matter was brought before a meeting of the Municipal Commissioners yesterday, when it was resolved that two hundred rupees be given from the Municipal funds for the purchase of fresh seed. I have undertaken to get it, and am anxious to get Van Dieman's land Potatoes. I hear that they are the best in the world; I used to prefer them to the New Zealand ones, when I was in the Colonies.

"I do not want to get seed from the other Hill stations, (Simla or Mussourie), it is sure shortly to deteriorate."

The Secretary stated that steps had been taken towards meeting Mr. King's request.

For the above communications and presentations the best thanks of the Society were accorded.

(Friday, the 24th November, 1865.)

A. Grote, Esq., *President, in the Chair.*

The proceedings of the last Meeting were read and confirmed.

The following Gentlemen were elected Members:—

Messrs. J. M. Courtney, H. C. Bowser, C. F. Montressor, C. S., H. C. Eddey, Capt. G. B. Fisher, General Peter Innes, Messrs. F. A. B. Geneste, R. H. Mackinnon, J. F. Ogilvy, Robert Park, Joseph Dacosta, D. C. Gordon, Capt. A. Tulloch, Superintendent of the Queen's Gardens, Delhi, Dr. J. McLeod Cameron, Col. A. E. V. Ponsonby, Baboo Trannath Chatterjee, Major H. B. A. Poulton, Messrs. F. Greenhill, P. A. Humphrey, C. S., T. E. Ravenshaw, C. S., Clement Wingrove, and the Superintendent Northern Assam Tea Company.

The names of the following Gentlemen were submitted as candidates for election:—

Lt.-Col. W. H. Seymour, C. B., 2nd Dragoon Guards,—proposed by the Secretary, seconded by Mr. Grote.

The Hon'ble G. N. Taylor,—proposed by Mr. Grote, seconded by Mr. S. Jennings.

H. J. Joakim, Esq., Calcutta,—proposed by Mr. Joseph Agabeg, seconded by the Secretary.

The following contributions were announced:—

1.—Selections from the Records of the Government of India in the Foreign Department, No. 46,—presented by the Government of India.

2.—Annual Report of the Administration of the Bengal Presidency for 1864-65,—presented by the Government of Bengal.

3.—Reports of the Central Committee of the Judges of the Oude Exhibition for the years 1864-65,—presented by the Chief Commissioner of Oude.

4.—A collection of ornamental plants from the Royal Botanic Garden, Calcutta,—presented by the Superintendent.

5.—A small assortment of plants,—presented by Mr. Geo. Bartlett.

6.—An assortment of plants,—presented by Mr. Z. M. Zorab.

7.—Two packets of acclimatized Cauliflower seed, six and eighteen months old,—presented by Dr. Geo. Henderson, Secretary Agricultural and Horticultural Society of the Punjab.

Dr. Henderson requests that the effect of keeping this acclimatized seed for one or more years, may be tested.

8.—A sample of Japanese Tea,—presented by Mr. Joseph Agabeg.

Mr. Agabeg states that the processes of making this Tea have been performed by steam machinery, at Nagasaki, by an English Gentleman. The processes occupy 12 hours only, when the tea is fit to be soaked and drank. Mr. Agabeg gives the following report on this Tea:—

"It is between Green Tea and Oulong Pouchong. It has a peculiar taste, but much improvement might be made in future, as the quality is good and very well adapted for India. It has not the muddy taste of our Cachar and Assam Teas, is clear as Oulong and Green when ready for drinking."

Mr. Willam Stalkartt exhibited cut-specimens of *Poivrea (grandiflora ?)* and *Asparagus adscendens* from his Garden at Goosree.

Reports were submitted by the Gardener on the germination of the American vegetable seeds, and of the English flower seeds, received this year by the Society. In respect of the former, seven kinds have entirely failed; four sorts have germinated but partially, and the remainder very fairly, namely, a general average of 60 per cent; of the flower seeds, 19 kinds have germinated, but the season having been very unfavorable hitherto, another sowing has been made, the result which of will be duly reported.

The Gardener also submitted a list of Rose plants, now ready for issue to those who have not received any this year, and to those whose names had been previously registered. There are about 30 kinds in all.

A NEW LEVER COTTON PRESS.

Read a letter from the Government of Bengal, forwarding copy of a letter and its enclosure for the information of the Society, in respect to Dr. Forbes' new Lever Cotton Press.

Agreed,—that the letter be published in this day's proceedings, and that a reference be made to Mr. Walton for a few copies of his Circular. The following is a copy of the letter:—

From W. WALTON, ESQ., in charge Office of Cotton Commissioner, Dharwar, to the Secretary to the Government of Bengal,—(No. 399, dated the 7th October 1865).

"I have the honor to submit, herewith, six copies of a Circular* I have drawn up on Dr. Forbes' new Lever Cotton Press, and, in so doing, to solicit the powerful assistance of the Bengal Government in bringing this most useful Machine into general notice in the Provinces under the Hon'ble the Lieutenant-Governor's rule.

2. With this end in view I shall have much pleasure in forwarding as many copies of the Circular as may be wanted.

3. With permission, I shall further be happy to forward Circulars to Officers in authority in the Bengal Cotton Districts. In such case I would beg the favor of being furnished with the addresses, &c., of Officers that I should communicate with.

4. It is not at places where Steam or Hydraulic Presses may already be established that I advocate the introduction of the invention, but at places where no such conveniences as yet exist; such as at Cotton marts away from main roads, Stations on lines of Railway, and on banks of navigable rivers, and in short at places generally where the better packing of cotton and fibrous materials will relieve the already too great demand on the transport means of the country.

5. The benefits of the Press to Railway, River Steamer, and Carrying Companies generally cannot be over-estimated: take for instance a Railway Goods Train, the gain in displacement of say thirty Trucks would be enormous; this also applies to the hold of a steamer, a cargo barge, or a country vessel.

6. The fortnightly Steamer from Bombay to Calcutta regularly calls at Carwar; by one of these vessels Presses could be forwarded.

7. I intend to have drawings of the machine made for circulation, but, from the absence of the necessary appliances in this part of the country, I fear a long time will elapse before a sufficient number are lithographed for distribution.

8. From personal experience I have almost invariably found that Indian Mechanics make great mistakes in constructing machines from drawings and specifications, no matter how clearly and detailed they be prepared, and, on this account, I most strongly recommend that Presses should, in the first instance, always be procured from the Dharwar Cotton Gin Factory."

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* Dated 26th September 1865.

JAPAN SILK WORM'S EGGS.

Read the following extract of a letter from Mr. R. B. Parr, of Hong-Kong dated 7th October, to the address of Mr. T. H. Mosely, in reference to Silk Worm's Eggs from Japan, respecting which some communications were submitted at the General Meeting in August last :—

"Since writing enclosed the "A. Apcar" has come in, bringing me your letter—in re *Silk Worm Eggs*. There will be no difficulty whatever in procuring some, but, as to whether they will be *Trivolin* or *Bivolin* is doubtful; there are men who say they know the difference, but they are not believed; the Japanese may know, but Asiatic-like they declare them all Trivolin. The Japanese seed introduced into Europe, has so far proved the most successful of *all* importations and such has been the demand in Japan, that grave doubts are entertained of spurious seed being palmed off; for *who* can distinguish a silk worm's egg from any other moths' egg, or from a manufactured imitation;—a deceit, the Japanese are quite capable of practising. Special Agents have been sent out there to obtain seed, and the French Government, through its Minister, is doing all it can to facilitate the export. The season is about ending, and I suppose nearly a million *cards* will have been exported. The eggs are sold adhering to a card of about 18 inches by 12. 500 cocoons, half male and half female, produce one card of seed. Consequently, 500 cocoons are thereby sacrificed as far as that cocoon being spun into silk, as you doubtless are aware the grub in the cocoon bursts the cocoon in emerging to breed or lay, and breaks the thread of the cocoon, which hitherto, in Japan, have been almost worthless, but now they are learning to spin a thread therefrom, and some have been exported to the Continent. 500 cocoons would have given ½lb of first class silk, multiply by 1 million.=500,000 lbs Silk, or 5,000 bales. As you may imagine, the Japanese Government were afraid they would be drained of silk, and were selling the goose that laid the golden egg, for they have been getting as high as $800 per pecul, (133⅓lb,) for their fine Silk. Restrictions were consequent, but these have been removed by pressure from the French and our Government, and eggs now freely come from the interior; the fear is, as I said before, that spurious and adulterated seed is being foisted off.

"I think the price ruled about one Itzeboo and quarter per card when I left. Say 2-6, and I estimated, of course roughly, a million sterling was being spent on these; to prime cost, you must add an expensive freight, packed in roomy boxes, and special arrangements are made on board the Steamers to give them air; in addition, you must allow for loss by addling and other loss.

"I will do all that is needful for your friends in the way of ordering them from Japan, or of obtaining information. Better that they come *viâ* this Port, and I can send them on *viâ* Galle if no direct Steamer is on berth.

"I fancy the cold season will be favorable for their reception in Bengal, and I will at once write to Japan for a dozen or twenty cards for you to experimentalize upon. Probably a sample of fine Mybash, best Japan Silk, will also interest your friends."

The following letters were also read :—

From R. Sturrock, Esq., of Dundee, reporting on a sample of the fibre of *Sida rhomboidea* (Suffed Bariyala) grown and prepared in the vicinity of Calcutta. The following is extract of Mr. Sturrock's letter :—

"I had your letter of 4th March last, as to the sample of "Sida," a very considerable time ago, but the sample itself only came to hand very lately. I have had it tested, &c., but there is a great complaint of want of strength. I notice however, that you state it was over-retted, so great care will be required to be taken, in future to preserve strength. The previous specimen was much better. I have no doubt that, if properly cultivated, *well* cleaned and retted, the requisite time only, it will become a useful fibre for our manufactures. As I wrote to you previously, the first offer of price may not be enough, but, if after being tried and found useful, it will find its marketable value. You can send me, therefore, as a trial, (provided the above conditions are attended to,) 5 or 10 tons, say the cost and freight not to be more than £20 per ton,—20 cwt. to the ton. If your friend has a quantity, and if he prefers it, he can then send it to my address here, and I shall sell it to the best advantage possible. Also, in the meantime, ship it as *Jute*. I have now a better opportunity than ever of getting it tried for fine yarns, which, I think, is the thing it is fit for. You may also bear in mind that, if any thing is to come of it, *Dundee* is the place to send it to, and especially as I really have good opportunity to do it justice. If it goes to London or Liverpool, it will be sold as Jute, and will never be heard of more."

From Col. E. T. Dalton, suggesting the introduction of *Ervum Ervilia* into Bengal. "In the 'Farmers' Magazine and Monthly Journal,' for October," observes, Col. Dalton, "there is a notice of a new fodder called '*Ervum Ervilia.*' 'Krsa Aleck,' introduced into France from Algeria. Mr. H. Stainforth has brought the article to my notice, and I agree with him in thinking it might prove a valuable acquisition in this part of India, when, during the dry months, there is conderable difficulty in obtaining suitable food for cattle. Could you manage to get some of the seed for us ?"

The Secretary mentioned that, by the last mail, he had addressed Mr. James Cowell, a Corresponding Member of the Society, on the subject.

From Major Willoughby Osborne, C. B., Bhopal, respecting the raising of *Pterocarpus Dalbergoides* from seed.—The following is extract of Major Osborne's letter :—

"I have just got some of the *Ponciana Regia* and *Pterocarpus Dalbergioides*, growing from seed. I have tried often before of getting seed from Madras; as I have succeeded at last, my experience may be useful to you and others.

"I find that to succeed, the winged part of the seed must be taken off and the seed taken out. It requires then to be sown in very rich soil, shaded at first during the heat of the day.

"The seeds must be sown carefully, as the plant will otherwise grow downwards, the roots coming above ground, and, unless turned at once, the plant dies.

I found one in which the two first leaves have been pushed downwards 2½ inches. Mine have been sown a month and are now 2½ inches high.

"The *Ponciana Regia* requires rich soil too.

"I find the *Ailanthus Glandulosa* (seed from China) grows well here; I have some about 3½ feet high.

"I hope to leave behind me here, a splendid variety of Chinese and Japanese trees."

From Dr. Chevers, Officiating Inspector-General of Jails, L. P., requesting the aid of the Society in obtaining a quantity of vegetable seeds for next season, for the use of the Jail Gardens. Complied with.

(*Wednesday, the 20th December,* 1865.)

A Grote, Esq., *President in the Chair.*

The proceedings of the last Meeting were read and confirmed.

The following Gentlemen were elected Members:—

Lieut.-Col. W. H. Seymour, C. B., the Hon'ble G. N. Taylor, and Mr. H. J. Joakim.

The names of the following Gentlemen were submitted as candidates for election:—

J. R. Reid, Esq., C. S., Officiating Deputy Commissioner, Nawabgunge, Barabankee, Oude,—proposed by the Secretary, seconded by Mr. Grote.

C. Prentis, Esq., Civil Assistant Surgeon, Mynpooree,—proposed by Mr. C. Horne, seconded by the Secretary.

F. S. Growse, Esq., C. S., Mynpooree,—proposed by Mr. Horne, seconded by the Secretary.

The following contributions were announced:—

I. Report of the Commissisoner of Agriculture of the United States of America, for 1863,—presented by Mr. C. H. Foster.

2. Catalogue of the organic remains belonging to the *Echonodermata*, in the Museum of the Geological Survey of India, Calcutta,—presented by the Superintendent.

3. Memoirs of the Geological Survey of India, *Palæontologia Indica*, 3, 9,—presented by the Government of Bengal.

4. Journal of the Asiatic Society of Bengal, Part 1, No. 4, 1865,—presented by the Society.

5. A small quantity of Wheat seeds of sorts, and of Oats from Cape Town,—presented by the Cape of Good Hope Agricultural Society.

These Cereals have arrived in good order, but unfortunately too late in the season.

6. A few Pine and other Australian seed,—presented by the Acclimatization Society of Melbourne.

7. Some bulbs of *Gloriosa superba*, and of an unkown plant from Jubbulpore,—presented by Major S. Ryder.

8. Seeds of Australian Spinach, *Chenopodium auricomum*,—presented by Mr. J. Kurz, on behalf of the Calcutta Botanic Garden.

9. Seeds of *Ardisia crenulata* from England,—presented by Mr. Robert Scott, late Head Gardener, Botanic Garden.

10. Another and larger ripe fruit of the Jhinga, *(Luffa acutangula)* measuring upwards of 3 feet in length, raised in his Garden at Satkira, from Benares seed,—presented by Baboo Debnauth Roy Chowdhry.

11. Sample of Nankin Cotton and Cloth,—presented by Mr. J. A. Loch.

The following is extract of Mr. Loch's letter regarding this Cotton :—

"I send you a specimen of Cotton, that grows exceedingly well and prospers at Kosee, a town in this District. I also send a sample of the cloth woven from the Cotton by the Kosee weavers. I shall be obliged by your informing me what would be the value of such Cotton in England. I enclose you a letter from the Secretary to Government, N. W. P., upon the subject. I have just seen the Cotton trees at Kosee. They are planted by Mr. Palmer, of the Customs Department, in his garden. The trees are very large, strong, healthy and hardy and can stand drought well. Each tree bears a great number of large pods, much larger than the Indian Cotton, and the seed, which orginally came from China, may be sown at any time of the year. It thrives well, even when irrigated by brackish water. All the water is brackish at Kosee. If you think this Cotton will be of any value in the English Market, further enquiries can be made. It is much hardier than the Indian Cotton."

The following remarks by Mr. T. H. Mosley, a Member of the Committee, were also read :—

"Your note accompanying samples of Nankin Cotton and cloth, together with letters relating to same, reached me last evening, and I regret that I cannot furnish the information required by Mr. Loch as to home value, &c., of this particular description, which, however, I am of opinion would find a ready sale in the English Market, if proper attention were paid to cultivation and improvement of staple. The sample staple before me is somewhat short and very weak. The following extracts of letters from the late Mr. Bingham, with reference to Nankin Cotton, may possibly prove of some interest, and I have therefore looked them up. He took a deep interest in these matters as you are aware.

"On the 24*th* April 1862, he wrote us, lamenting the loss of his Nankin Cotton plants through neglect of an Assistant, and adds.—'This is the more to be regretted, as from a letter received last mail from my Correspondent of Manchester, (noticing the receipt of a small parcel of Nankin Cotton) a Nottingham Hosiery House had offered to take 100 bags of it at ten pence (10*d.*) per lb., which would pay, as it is by far the most prolific Cotton I have seen.'

"'On the 22nd July 1862, he wrote, my friend says 'your Nankin Cotton in goods is represented at the Exhibition amongst the Nottingham Manufactures; the staple, as I told you, was not very good, but the colour for, this description of goods at least, is in its favor; can you not improve the staple?' Certainly I can, and very materially, as all that was sent home was from my original plants, now 5 years old. The crop from the plants now growing will be of a much improved staple, as I find it deteriorates yearly with the age of the plant, and I know this Cotton will pay the culture.'

" Mr. Binghams Cotton, as above referred to, was grown on his Soane Estate, and on the last occasion I saw him,—shortly before his death,—he expressed himself very hopefully regarding the cultivation of this description, with improved results. On reference back, I find that in March 1862, (about the time when Mr. B's Nankin Cotton was valued, and in fact, commanded 10*d.* per lb) middling New Orleans was worth 12¼*d.*, and Bengal 5*d.* to 6*d.* per lb. On the 29th September 1865, middling New Orleans was quoted 22*d.* and fair Bengal 10¼*d*, per lb.

" 'If you think it well to recommend Mr. Loch to send us a fair sample, and he complies, we shall have much pleasure in obtaining full information from our home people as to value of the Cotton, and prospects for sale, &c.' "

The Secretary mentioned that, in sending Mr. Loch a copy of Mr. Mosley's remarks, he had requested his attention to the closing paragraph.

A very favourable report was read from the Head Gardener on the small experimental supply of Vegetable Seeds received from Messrs. Vilmorin Andrieux & Co., of Paris. Mr. Errington also submits a list of a few kinds of plants of which he will have a sufficiency in stock for general distribution, at the commencement of next year, including Heliotropes, Verbenas of sorts, Crotons of sorts, Roses of sorts, *Tropæolum canariense*, *Abutilon marmoratum*, *Podocarpus Chinensis*, Phlox, Dianthus, and Hollyhock seedlings.

Read a letter from Secretary to the Government of Bengal, forwarding 50 copies of Dr. C. Palmer's report on the Cattle disease which appeared at the time of the Agricultural Exhibition at Alipore, in January 1864.

Agreed, that the report be printed in the next Number of the Journal.

A paper was submitted by Mr. J. H. Gouldhauke, entitled—" Some remarks on the inprovment of the manufacture of Indigo,"—Referred to the Committee of Papers.

A letter was read from Messrs. Vilmorin Andrieux, of Paris, enclosing invoice of a collection of 350 Rose plants of the best kinds for the Society's Garden, consisting of 83 varieties.

This collection is expected by the next Steamer.

REPORT

OF THE

Agricultural and Horticultural Society

OF INDIA.

Report from the Council to the Society at the General Meeting of the 17th, January, 1866.

In submitting their Annual Report to the Members, at their present General Meeting, the Council have the pleasure of announcing that the affairs of the Society continue to progress satisfactorily.

The number of Members (163) elected during the past twelve months is greater than in any previous year since the formation of the Society; and the decrease by deaths and resignations is less than last year. The Council have again, however, to observe, with regret, the small proportion (8) which the Native Community bears to the above mentioned large accession. The following tabular statement, in continuation of former reports, will shew at a glance the present constitution of the Society.

CLASSIFICATION.	In 30 previous years.	In 1851.	In 1852.	In 1853.	In 1854	In 1855.	In 1856.	In 1857.	In 1858.	In 1859.	In 1860.	In 1861.	In 1862.	In 1863.	In 1864.	In 1865.	Gross Total.	Total real number at the close of 1865, after deducting lapses
Honorary Members, ...	13	0	1	0	1	0	2	0	0	1	0	0	0	0	0	0	18	9
Associate Members, ...	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2
Corresponding Members,...	1	1	1	1	0	0	0	0	1	0	0	1	0	0	2	0	8	6
Civilians, ...	300	22	16	18	6	23	23	17	19	28	28	22	13	12	18	30	595	202
Merchants and Traders, ...	264	20	12	5	16	18	31	11	20	15	18	17	19	24	17	22	529	156
Indigo and other Tropical Agriculturists, ...	226	19	13	10	7	14	12	10	14	20	15	15	21	20	20	41	477	170
Military Officers, ...	212	34	18	22	19	26	22	12	14	27	38	26	25	10	21	31	557	156
Medical Officers, ...	97	4	5	3	4	6	9	3	3	16	11	6	7	5	7	14	200	58
Asiatics, ...	99	8	8	8	5	5	7	14	19	4	6	8	3	7	9	8	218	70
Clergy, ...	17	1	1	1	1	2	1	2	0	0	1	0	0	2	0	3	32	8
Law Officers, ...	51	6	3	1	3	6	2	1	5	2	1	2	4	2	3	4	96	25
Miscellaneous, ...	15	6	0	0	10	0	0	2	7	5	5	0	12	9	3	10	84	44
	1,298	122	78	69	72	100	109	72	102	118	123	97	104	91	100	163	2818	906

N. B.—Of these 906 Members 198 are Resident in Calcutta, 585 in the Country, and 123 in Europe.

The lapses alluded to in the last column comprise 16 deaths,* 48 resignations, and 10 removals from the list in accordance with Section 6 of Chapter iii of the Bye-Laws, their absence from India having exceeded four years—making in all 74.

Of the total number (906) in the printed list, 32 are Life Members, 91 are absent from India, 17 are Honorary, Associate and Corresponding, leaving 765 as the number of paying Members on the books of the Society, or 69 more than last year.

In the list of Members lost to the Society by death will be found the name of Mr. W. G. Rose. Though at the first monthly meeting held after his demise a tribute of respect was paid to his memory, the Council cannot silently record the loss which the Society has sustained by the departure from among them of an Associate of 28 years standing,—of one who had been a Member of their Body since its formation, who had the welfare of the Society so much at heart, and had constantly endeavored, to the best of his ability, to promote its prosperity.

On the important matter of finance the Council have again to express their regret that, notwithstanding frequent applications, the amount of arrears of subscription continues so large. Of the total sum outstanding on the 31st December, namely Rs. 15,572, Rs. 1,626 are due from Town Members and Rs. 13,946 from Country Members. As the amount against Town Members is made up principally of subscriptions due for 6 and 3 months, we may hope to realize the whole shortly. The sums against certain Members are so heavy that it is to be feared a large amount, probably not less than Rs. 5,000, will have to be written off to profit and loss during the current year. The Council would again observe that there is less excuse now than formerly for such heavy arrears, in as much as the money order offices in the Lower Provinces have removed a difficulty which, perhaps, previously justified a want of punctuality in making small remittances. It is satisfactory to add that notwithstanding the extra expenditure on account of prize Essays, the loan of Rs. 5,000 taken from the Bank of Bengal in 1864 has been entirely paid off during the past year.

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* Messrs. P. J. Delaney, J. W. Garstin, Wynne Jones, J. Taylor, Geo. Wilkinson, Senior, J. P. Hampton, W. G. Rose; General James Mathie; Major General G. W. A. Lloyd, Captain H. E. Read; Baboos Ramnarain Mookerjee and Sreekissen Sing, Messrs. C. S. Steig, E. C. Heddan, Henry Cowie and D. C. Mackey.

As anticipated in the last report the distribution of plants from the garden has been less in 1865 than in previous years, consequent on the heavy losses sustained by the Cyclone of October 1864. From the returns furnished by the Gardener it would appear that the total quantity has not exceeded 8550. In this number is included 2420 fruit grafts. Rather more than one-third has been distributed to non-Resident Members.

In the early part of the year the Government of Bengal intimated that the Superintendent of the Royal Botanic Gardens had applied for resumption of the piece of ground which the Society had been permitted to occupy for many years as a Nursery Garden, and that such application had been complied with. The Council have accordingly already transferred to Dr. Anderson about one-third of the area on the Western side, which had been hitherto used partly as an economic garden and partly as an orchard; and the remaining portion will have to be made over as required. Simultaneously with the above announcement the Government of Bengal offered the piece of ground lying between the Allipore and Kidderpore Bridges, and bounded by the Circular Road and Tolly's Nullah, for a Nursery Garden, subject to certain conditions prescribed by the Government of India. The Council respectfully declined this ground on the conditions attached to the offer, being moreover of opinion that the site in question is by no means suitable for the purposes of a garden and the cost of laying it out would be more than the means of the Society warranted. The conditions prescribed are that it be laid out as an *Ornamental Garden*, not as a Vegetable Garden or Nursery, that no building of any kind shall be erected on it without express sanction, and that the Government shall have the legal right of resuming it whenever it may seem necessary in the public interest to do so. Since that time the Council have been seeking for a site for a new garden but as yet have been unable to find any spot in the vicinity of Calcutta suitable for such purpose. It having, however, been brought to the notice of the Council that a portion of the Ballygunge Cantonment, which would in many respects be a suitable locality, and which, it would appear, has not been occupied for several years by the Governor General's Body-Guard, might be made available for their garden, they have addressed the Government of India in the Military Department on the subject. To this application a reply has not yet been received.

In consequence of the Town-Hall not having been available, and no other suitable building obtainable for the purpose, the Council were unable to hold a second show last year. It may however be mentioned that the exhibition of the 10th February contrasted most favorably with previous shows. As respects vegetables and fruits it was considered about one of the best that had been held; while in regard to the floricultural department it was remarked that perhaps at no previous show for the last 14 years were so many well flowered plants, and so many well grown specimen plants submitted as on this occasion; it was clearly a decided step in advance.

The importations of seeds last season have proved tolerably good. The experiment of having the shares of seeds from England, intended for Mofussil Members, packed in tin boxes previous to despatch, has resulted so far satisfactorily that the Council have authorized the entire consignment for 1866 being similarly treated; and thus the seeds will be entirely saved from exposure to the damp climate of Bengal which has, hitherto, been found so injurious to consignments from England. The supply from the United States though probably not quite so good as in former years, has nevertheless given satisfaction. The field seeds from Melbourne, with a few exceptions, have also resulted favourably.

Among other questions which have engaged attention during the past year that of Agricultural Education with reference to the capabilities and requirements of the Lower Provinces of Bengal has been one of the most important. The reply of the Society to the communication of the Director of Public Instruction on this interesting subject was submitted at the monthly meeting in February, and has been printed in the Journal. It may therefore suffice to note in this place that after having duly and carefully considered the subject in all its bearings, the Council recorded it as their opinion, "that the time had not yet arrived for the appreciation of the importance of Agricultural Education as a speciality, and the Society could not properly recommend an outlay of public money in attempts to promote it."

Another subject which has likewise been considered at several successive meetings has reference to the revision of prize lists, and to other details connected with future Agricultural Exhibitions. The subject was mooted in the first instance by Mr. Halsey, the Secretary of the Benares Agricultural Society, and followed up by Dr. David Scott of Umballa, who has also offered some useful hints in respect to the breeding of cattle. The Council have since addressed the Government of Bengal fully on this and other kindred subjects, and have recommended the appointment of a Committee to revise the prize lists for the Bengal Districts, so far as the grants from Government are concerned; and such lists, they are of opinion, may probably, with some modification, be likewise useful in assisting Judges at future exhibitions in the North-Western Provinces.

The Society have communicated with the Government of India in continuation of previous correspondence in 1862 and 63 in respect to the proposed Museum of Economic Botany in connection with the Imperial Museum. In their last letter the Council promise, on behalf of the Society, to transfer, as a nucleus towards the suggested Museum, duplicates or portions of the more interesting and useful specimens of vegetable and animal products, which have been accumulating in their Museum during the last quarter of a century. The Governor-General in Council have stated, in reply, that while they are favourably disposed towards the constitution of a branch of the nature indicated, they are disposed to think the Imperial Museum is yet too much in embryo state to make it advisable to take this proposed additional branch in hand at the present time.

Some further interesting information has also been placed before the Society in continuation of that obtained in 1864 regarding the fruiting of a Hill Bamboo (*Bambusa baccifera?*), in Rungpore, from stock said to have been originally brought from the Garrow hills; and particulars have likewise been communicated respecting, probably, the same species, from Tipperah, Chittagong and Arracan.

The attention of the Society has likewise been attracted towards two varieties of Silk-worm (*Bombyx Mori,*) from Japan, which is said to be far superior to that of Bengal; and steps have been taken with the view of procuring eggs for trial in this country.

It was stated in the last report that prizes had been offered for the best practical papers on the culture and manufacture of Tea as applicable to the Hills and Plains. It may now be added, by way of record, that two prizes, of Rs. 500 each, have been awarded to Messrs. H. A. Shipp and W. C. Muller for their treatises on this subject, the one from Cachar and the other from Darjeeling.

Other subjects connected with cotton, tobacco, coffee, fibres &c. have also received attention during the past year, and reports submitted on samples sent in for valuation and opinion. The question of the cultivation of superior kinds of tobacco in British Burmah is an important one, and has been several times before the Society.

A revised catalogue of the books in the Library will shortly be put to press; a catalogue of the Museum is also in course of preparation.

Three Numbers of the Journal have been published during the year viz. Part 4 of Vol. XIII, Part 1 of Vol. XIV, and a Supplementary Number of Vol. XIV, containing the prize essays on tea culture above referred to. Part 2 of Vol. XIV is now in the press.

Statement of Receipts and Disbursements of the Agricultural and Horticultural Society of India from 1st January to 31st December 1865.

RECEIPTS.

From Members, subscriptions collected during the year, ..				18,257	8	6
,, Government refund of income tax for interest on Government Securities, ..	127	13	0			
,, Secretary Bank of Bengal for the difference of margin on loan of Rs. 3,000, ..	25	0	0			
Government Annual Donation, ..	5,000	0	0			
				5,152	13	0
,, Accruings of Interest on Government Notes, ..				785	5	4
,, Coll. A. P. Phayre for Tea seed, ..				25	0	0
,, Proceeds of Oats, ..	0	10	0			
,, Ditto of 3 maunds and 5 seers of American Cotton seed, ..	78	2	0			
,, Ditto of 6 maunds of Jute from the Nursery Garden, ..	9	0	0			
,, Ditto of Sugar-canes, ..	3	12	0			
,, Ditto of Fruit-grafts, ..	515	0	9			
,, Ditto of Jerusalem Artichokes, ..	1	8	0			
,, Ditto of a portion of surplus stock of English and American Vegetable and English flower seeds, ..	3,085	0	0			
,, Proseeds of copies of publications of the Society, ..	159	10	0			
,, Ditto of casks, boxes &c., ..	35	15	0			
,, Members amt. for pots and packing charges for seeds &c., ..	1,070	15	0			
,, Ditto, amt. repaid for freight on boxes of seeds forwarded in 1864-65, ..	168	14	0			
				5,128	6	9
				29,349	1	7
To Balance on the Bank of Bengal on 31st December 1864, ..	2,754	0	6			
,, Ditto in the hands of the Secretary on 31st December 1864, ..	77	8	8			
				2,831	9	2
Grand Total Rs., ..				32,180	10	9

DISBURSEMENTS.

By Messrs. James Carter & Co., for seeds supplied in 1863, ..	992	4	0			
,, Messrs. D. Landreth and Sons, in part for American Vegetable seeds supplied in 1865, ..	2,938	12	4			
,, Messrs. Law Somner & Co., in full of their bill for Agricultural seeds supplied in 1864-65,	929	14	3			
				4,860	14	7
LOAN.						
,, Secretary Bank of Bengal in full of Loan, ..	5,000	0	0			
,, Ditto for interest and stamped bond for a loan of Rs. 5,000, ..	235	6	6			
Carried over Rs., ..	5,235	6	6			

Brought forward, .	5,235	6	6	4,860	14	7
By Ditto for the difference of margin on the loan of Rs 3,000, ...	25	0	0			
				5,260	6	6
LIBRARY.						
,, Books purchased during the year for the Library	71	0	0			
,, Binding books during the year, ...	42	4	0			
				113	4	0
PRINTING.						
,, Sundry parties for printing receipts, schedules for prizes for flower shows, Code of Bye-Laws, &c., ...	..		..	79	8	0
JOURNAL.						
,, Bishop's College Press for printing &c, 700 copies of Journal Part 4 Vol: 13 and Part 1 Vol: 14, ...	744	2	3			
,, City Press for drawing and printing &c, 3,600 copies of plates for Journal, ...	220	0	0			
,, Ditto for printing 700 copies of Monthly Proceedings for ditto, ...	157	4	0			
,, Journals purchased, ...	3	12	0			
				1,125	2	3
GRANT TESTIMONIAL						
,, Messrs Humpidge & Co. for a dozen copies of Photograph of the late Sir J. P. Grant,	..		.	20	0	0
PRIZES.						
,, Mr. H. A. Shipp for prize awarded for Tea Essay in Cachar, ...	500	0	0			
,, Mr. W. C. Muller for Do. for Do. in Darjeeling,	500	0	0			
				1,000	0	0
NURSERY GARDEN.						
,, Ordinary expences incurred on account of the Nursery Garden from 1st December 1864 to 30th November 1865, ...	4,725	15	3			
,, Extra expences incurred for purchase of fruit seedlings for grafting, for glazed cases, pots, building a long house and sundry other contingent expences, ...	1,310	14	0			
,, Grindlay & Co., on account of Rose plants and bell glasses, ...	410	11	3			
				6,447	8	6
ESTABLISHMENT.						
,, Amount for establishment from 1st December 1864 to 30th November 1865, ...	..		..	9,049	12	9
ADVERTISEMENT.						
,, Advertising notices of General Meetings, of shows of vegetables and flowers, distribution of seeds &c., ...	.		..	180	4	6
FREIGHT.						
,, Freight on boxes of seeds, books &c. sent and received from America, England and Melbourne, ...	..		.	757	10	3
PECUNIARY REWARDS.						
,, Prizes to Mallees for vegetables and fruits at Exhibition held on 10th February 1865, .	274	0	0			
,, Do. do. for flowers at Do. do. on 10th do., .	195	0	0			
				469	0	0
Carried over Rs.,				29,363	7	4

Brought forward, ...				29,363	7	4
FURNITURE.						
By sundry articles of furniture, ...				38	0	0
METCALFE-HALL.						
,, Society's proportion of assessment on the Metcalfe-Hall from October 1864 to September 1865, ...	360	0	0			
,, Do. do. for Lighting Tax from Do. to Do., ..	72	0	0			
,, Messrs. Bnin & Co. in full for Societys proportion of two lightning conductors, ..	421	2	0			
,, Mr. W. R. Gilbert Hickey fee for reporting on iron-girder beam, ...	40	0	0			
				893	2	0
STATIONERY.						
,, Stationery for office books &c. and for the use of the Office, ...				62	15	0
MEDALS.						
,, Messrs. Charles Nephew & Co. for 6 Silver medals, ...				120	0	0
PETTY CHARGES.						
,, Sundry charges, including postage on letters &c. sent and received and for copies of the Journal, ...	667	2	3			
,, Extra writers and packermen for sub-dividing and writing on seeds papers &c and for soldering tin boxes sent to non resident Members and for other petty charges, .	125	5	6			
,, Expences incurred for superintending the erection of tents and in putting a fence round a portion of the Auckland Garden for flower and vegetable show, ...	80	2	3			
,, Dr. Shekleton for the services of the Town Band,	70	0	0			
,, Mr. W. Bennett for proceeds of sale of 12 copies of his Cotton Essay from July 1864 to July 1865, ...	6	0	0			
,, Messrs Grindlay & Co., being balance due to them as per acct. dated 3rd May 1865, .	132	4	6			
,, Messrs J. H. Fergusson & Co. being the amt. of subscription refunded on account of Coll E. R. Priestley, ...	24	0	0			
,, Secretary Bank of Bengal, for renewing notes and for fees and commission, for drawing interest on Government Securities,	5	15	1			
,, Government for income tax on interest on Government Securities, ...	13	6	0			
				1,124	3	7
				31,601	11	11
,, Balance in the Bank of Bengal on 31st December 1865, ...	538	8	5			
,, Do. in the hands of the Secy on 31st Dec. 1865,	40	6	5			
				578	14	10
Grand Total Rs., .				32,180	10	9

MEMORANDUM.

DISBURSEMENTS.

To amount of disbursements during the year 1865 as per statement, ...		... 31,601 11 11
„ Balance in the Bank of Bengal on 31st December 1865, ...	538 8 5	
„ Ditto in the hands of the Secretary on 31st December 1865, ...	40 6 5	
		578 14 10
Total Rs.,...		32,180 10 9

RECEIPTS

To, amount of receipts during the year 1865 as per statement, ...		... 29,349 1 7
„ Balance in the Bank of Bengal on 31st December 1864, ...	2,754 0 6	
„ Ditto in the hands of the Secretary on 31st December 1864, ...	77 8 8	
		2,831 9 2
Total Rs.,...		32,180 10 9

LIABILITIES.

James Carter & Co. balance of consignments of seeds for 1864 and 1865, ...	£ 1,375 13 6	13,760 0 0	
Landreth and Sons balance of consignment of American seeds 1865, ..	$ 244 62		
Deduct half cost of Cotton seeds, ...	148 31		
	$ 96 31	193 0 0	
			13,953 0 0

DEPENDENCIES.

Amount invested in Government Securities lodged in the Bank of Bengal, ...		16,633 5 6
Ditto of Subscription in arrear, ...	15,628 10 3	
Ditto outstanding for seeds, grafts, copies of Journal &c. &c., ...	2,071 1 3	
		17,699 11 6

JOURNAL

OF THE

Agricultural and Horticultural Society

OF

INDIA.

EDITED BY

THE COMMITTEE OF PAPERS.

VOL. XIV.

PART II.—JANUARY 1865, TO DECEMBER 1866.

CORRESPONDENCE AND SELECTIONS.

Calcutta:
BISHOP'S COLLEGE PRESS.
M.DCCC.LXVII.

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JOURNAL

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(SUPPLEMENTARY NUMBER.)

Prize Essay on the Cultivation and Manufacture of Tea in Cachar. By H. A. SHIPP, *Tea-planter, Manager of the "Concordia" Tea Estates, Cachar.*

PREMIUM.—FIVE HUNDRED RUPEES.

[In the composition of this Essay I have endeavoured to delineate, in as brief and succinct a manner as possible, the experience gained, during a five years' residence in Cachar, as Assistant and Manager on different tea plantations in that District, where I theoretically studied the excellent works of Mr. Fortune, Dr. Jameson and others, reducing their ideas and suggestions to practice on my own gardens.]

INTRODUCTORY NOTICE OF TEA.

TEA, which is now becoming an universal beverage throughout the civilized world and has been the means of attracting so much attention recently to British India, was common in China in the sixth century after Christ, but was unknown in Europe till the beginning of the seventeenth century, when it was carried there by the Dutch East India Company, and is said to have been first introduced into England in 1666, A. D.

The tea-plant has been found indigenous in China between the 23° and 33° North Latitude, in Assam (26° to 28° N. L.), in Cachar (23° to 25° N. L.) and in Burmah 21° to 23° N. L.) and was first introduced into the Himalayas by the English East India Company in 1848. Its cultivation is now rapidly extending over Northern and Eastern India, as well as in the Madras Presidency, and it promises to become one of the most lucrative products of this vast Empire, benefitting alike the European settler, the Indian peasant, and the British Government, directly and indirectly, to an extraordinary degree.

The several varieties of tea, known under divers names, are derived from the leaves of two species of the same shrub; called by Botanists "*Thea chinensis*" and "*Thea viridis*," which belong to the family of the Camellias and bear to them a strong and marked resemblance.

The teas of commerce are of two kinds, namely *green tea* and *black tea*, which are both produced from the leaves of the same plant, differing only in age and manipulation. To the *green* varieties belong Twankay, Hyson, Imperial and Gunpowder; and to the *black*, Pekoe, Souchong, Congou and Bohea.

There are certain requirements in the cultivation and manufacture of tea, without which success can *never* be attained. They may be briefly enumerated as (1) the suitability of the site selected for the plantation, (2) its proximity to water-carriage, (3) labour, (4) the experience, theoretical and practical, of the Manager and (5) a sufficiency of capital.

Having premised thus much I now proceed to take up in succession the several points whereon information is desired by the Agricultural and Horticultural Society.

1. *Selections of sites, soil, and climate.*

The best site for a tea-plantation is that commanding water-carriage in its vicinity, with a Site.

good flat, or undulating, lay of land, sufficiently elevated to give a natural drainage, and carefully avoiding all steep localities, which are liable to landslips and difficult of cultivation; though it is advisable to be as near a range of hills as possible, both to secure a sufficient rain fall during seasons of drought and to be sheltered from the North Westerly gales, which are generally accompanied by heavy hail storms and entail considerable damage. The proximity of water is advantageous for easy irrigation of the nurseries, as well as of the young plants during their first year's growth, and for the ready transport of the manufactured tea.

Soil.

The soil most preferable is a light, friable, filtry, reddish, ferruginous clay, free from stones or slate, which prevent the tap-root penetrating to a sufficient depth to allow of the plants attaining their full vigour, and very often are the means of killing them.

Climate

The climate, where the tea-plant has been found to thrive best, is that in which periodical rains occur, and where the heat is not so intense as to check the full developement of the plant, or a temperature ranging from a maximum of 100° to a minimum of 30°.

2. *Clearances: trees to be retained for shade or protection in exposed localities, for boxes, fuel, &c.*

Clearances.

Station.

In commencing clearances the first and most important measure is to clear a sufficient space for a commodious, though temporary, Station, as well as to cut down and burn off all the surrounding jungle, whether grass, brushwood, or timber to a distance of three hundred yards, in order to prevent the possibility of any after destruction of the buildings by fire, either accidental or designed.

Plantation.

The clearance for the plantation ought to be governed by the *description* of *seed* used and *manner* in which it is to be sown.

Hybrid & China Seed.

Hybrid and *China* seed may either be sown at the stake or from nurseries. If the former mode be pursued, the whole of the jungle should be cut down with the exception of such timber as it might be desirable to retain for building and other purposes. If the latter, small trees should be left as a temporary shade, especially on the western side, so as to protect the young *transplants* from the fierce heat of the afternoon sun.

Indigenous Seed.

Indigenous seed ought always to be sown in nurseries, as it produces a very tender and delicate plant, and should never be removed until the second season, when it should be planted under light shade, which ought not to be cut down till the following year.

Trees to be retained for shade or protection in exposed localities, for boxes, fuel &c.

It has been already suggested to retain for shade during the first two years all trees that may be made useful on the estate; but, if the land to be cleared be grass, and not tree jungle, the "goomaya" *(Gmelina arborea?)* mango, castor-oil plant and *Erythrina Corallodendron* may be planted with advantage, at distances varying from fifteen to twenty feet at the discretion of the planter; but in the third year, all shade should be removed, as it is most essential to the health and vigour of the plant that it should have light and air.

Trees for boxes

The best woods for boxes are those which are light and contain no resinous properties. The following is a list of those that are most useful and may be quickly raised :—

1. Goomaya *(Gmelina arborea?)*
2. Aam (mango) *(Mangifera Indica)*
3. Sutrong *(Sterculia species?)*
4. Toondoor *(Sterculia species?)*
5. Mooál *(Canarium?)*
6. Kuthál (jack) *(Artocarpus integrifolia)*
7. Simmool (cotton plant.) *(Bombax pendandrum?)*

8. Toon *(Cedrela Toona?)*
9. Huldie *(Bixa orellana?)*

The above trees would also make excellent wood for charcoal, with the addition of "*Ping,*" a very common tree in Cachar and Sylhet; and the following would make the best timber for all factory buildings:—

Trees for fuel and timber.

1. Nugessur. *(Mesua ferrea.)*
2. Sal *(Shorea robusta.)*
3. Seesoo *(Dalbergia Sissoo.)*
4. Teak *(Tectona grandis.)*
5. Cham *(Artocarpus chaplasha.)*
6. Jarool *(Lagerstrœmia Reginæ.)*
7. Runga Ratta *(Cedrela species?)*

3. *The laying out of a garden.*

Roads

Planting lines.

In laying out a garden the first thing to be done (after hoeing) is to line and stake off roads, twelve to fifteen feet in breadth for the *main* and six for the *cross* roads; after which lines for the plants should be marked off at right angles to the roads as much for economy of labour in planting out as for the subsequent appearance of the garden. These lines should be crossed transversely at a distance of four feet apart for the China variety, and for Hybrid and Indigenous five to five and half feet; and at each crossing a good stake, three feet high, should be driven firmly into the ground to mark where the seed or seedlings are to be placed. Fruit and ornamental trees may afterwards be planted along the sides of the roads in such a way as not to interfere with the growth or cultivation of the tea plant while the effect on the garden would be enhanced.

Fruit and ornamental trees.

Factory Buildings.

The residence of the Manager and principal factory-buildings, as Godown, Tea-House, Packing-House &c. &c. should be in as centrical and elevated a position as possible, for the sake of health, the readier supervision of all persons on the estate, and the equalization of the distance from the remoter parts of the garden.

Coolie lines.

Hospital.

Latrines, Wells and Tanks.

The Coolie-lines, on the other hand, should be at least half a mile from the factory, so as to ensure against accidents by fire, or disease from overcrowding, and should be surrounded, at a distance of fifty feet or upwards, by fruit or other trees, in order to absorb and arrest all malaria, which is a fertile source of disease. The Coolies should also be encouraged to plant and form vegetable gardens both as a recreation and as a mode of supplying themselves with a wholesome variety of food. It is advisable to erect the Hospital to the North of the Station, as during the sickly (Rainy) season, the prevailing wind is from the South, and thus, by adopting this plan, the spread of contagious epidemics would be prevented. Latrines and wells or tanks should be dug near the Coolie-lines and Hospital for the sake of health and cleanliness. Good water is a matter of the first consideration on an estate, as from the use of impure water, many diseases, both of an internal and external nature, are engendered. No building should, under any circumstances, be permitted within one hundred yards of the Factory, which should be surrounded by a fence and ditch, or low wall, and the space within kept as clean as possible, to effect which the ground might be advantageously laid out out as a flower, fruit and vegetable garden with trees planted here and there to beautify and improve it.

Before quitting this subject, it may not be deemed superfluous to offer some suggestions as to the nature and number of buildings required to be erected.

Residence of Manager.

The residence and out offices of the Manager, on first opening out the estate, might be roughly and cheaply built of the materials procurable on the spot, as jungle-timber for posts and roofing grass for thatch, and bam-

tion as possible, for the sake of health, the readier supervision of all persons on the estate, and the equalization of the distance from the remoter parts of the garden.

The Coolie-lines, on the other hand, should be at least half a mile from the factory, so as to ensure against accidents by fire, or disease from overcrowding, and should be surrounded, at a distance of fifty feet or upwards, by fruit or other trees, in order to absorb and arrest all malaria, which is a fertile source of disease. The Coolies should also be encouraged to plant and form vegetable gardens both as a recreation and as a mode of supplying themselves with a wholesome variety of food. It is advisable to erect the Hospital to the North of the Station, as during the sickly (Rainy) season, the prevailing wind is from the South, and thus, by adopting this plan, the spread of contagious epidemics would be prevented. Latrines and wells or tanks should be dug near the Coolie-lines and Hospital for the sake of health and cleanliness. Good water is a matter of the first consideration on an estate, as from the use of impure water, many diseases, both of an internal and external nature, are engendered. No building should, under any circumstances, be permitted within one hundred yards of the Factory, which should be surrounded by a fence and ditch, or low wall, and the space within kept as clean as possible, to effect which the ground might be advantageously laid out out as a flower, fruit and vegetable garden with trees planted here and there to beautify and improve it.

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The residence and out offices of the Manager, on first opening out the estate, might be roughly and cheaply built of the materials procurable on the spot, as jungle-timber for posts and roofing grass for thatch, and bam-

Residence of Manager.

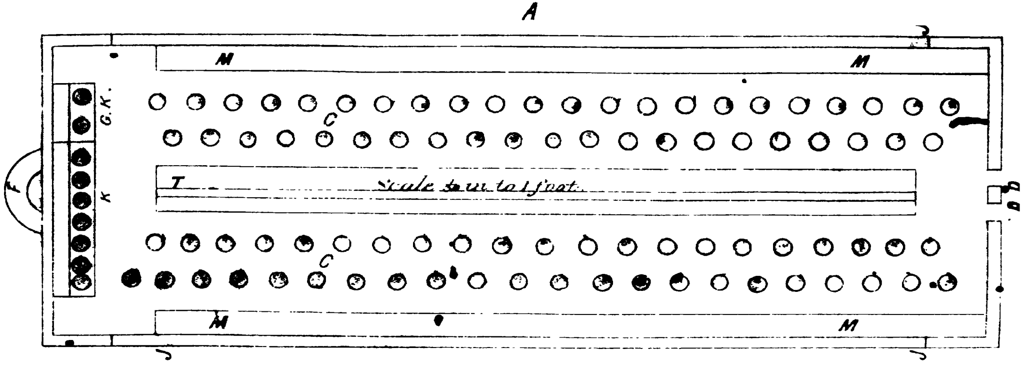
T.	Tables for rolling leaf.
C.	Choolhas of masonry
M.	Shelves for leaf-cooling, and for resting teas on during course of manufacture.
DD.	Doors-six feet wide.
J.	Open venetians, or windows, for airing and cooling leaf.

(0)

B.	Sectional Elevation of inclined plan, 32° from Horizon.
C.	Sectional view of the horizontal, or Green-Tea pan.

PLATE I.

PLAN OF TEA-HOUSE.



boos or "ekor" for walls with cane bindings. Care should always be taken to raise the flooring, by the erection of a bamboo platform, to a height of at least three feet from the ground, so as to avoid all chance of disease from the rise of malaria which is very prevalent in newly cleared forest. This house should be so substantially erected as to last three years, by which time every building on the estate ought to be made permanent by being constructed of masonry which would prove cheapest and best in the end, as no repairs would be needed and no risk of fire run.

Godown.

The Godown, made of the same material as the preceding, will also be but a temporary building for the first three years, or until a good crop of tea may reasonably be expected, when it should, like the Manager's residence, be built of masonry, and ought to be capacious and well ventilated, with an asphalt flooring and corrugated iron, or flat roof.

Tea House

The Tea-House will not be required till the third year, when it should at once be built of masonry of a size suited to the area of the estate or land under cultivation. One roasting-pan is calculated to be sufficient for the manufacture of the produce of fifty acres, and should be set in the masonry at an angle of 32° for black, and horizontally for green tea. This building should also contain two strong wooden tables running down its centre four feet broad and three feet high, so as to enable the tea-makers conveniently to roll the leaf. The pans should be arranged across one end of the building with flues carrying off the smoke, and four or five tiers of shelves should line the walls for the purpose of storing the leaf as brought from the field. Between the tables and shelves two rows of brick-built fire-places, called "*choollas,*" should be erected at a distance of six feet from each other for drying the tea. (N. B.—To illustrate this plan a diagram is annexed).

The packing-House should be a commodious building of

Packing-House.

masonry for the purpose of containing large wooden bins lined with lead or zinc, capable of storing a thousand pounds of tea. The object of these bins is to equalise the quality and flavour of the tea by keeping each particular description separate until every arrangement has been made for its being packed and despatched from the factory. This building ought also to contain a number of charcoal fire-places for finally drying the tea previous to packing.

Coolie-lines.

The Coolie-lines, which may at first, as a temporary measure, be built of timber, bamboo, and grass, should, with as little delay as possible, be constructed of masonry, in one long range with arched roofs, so that all chance of fire may be avoided, by the entire exclusion of wood with the exception of the doors or, if considered preferable, each Coolie might be accommodated with a separate hut built with mud on the principle observed in Upper India. This plan might, in the case of men of several castes being assembled together, be more advantageous, and, if each hut stood in a small cultivated enclosure, the health and comfort of the Coolies would be greatly improved.

Hospital.

The Hospital should be a long, spacious, well ventilated, brick-built building, facing the South, with a boarded floor and supplied with a double row of iron bedsteads. A wide verandah should surround the building, and at either end rooms should be partitioned off for a dispensary and separate ward for men suffering from contagious diseases.

Every building in the Factory should be erected with walls sufficiently thick and substantial to allow of a second story being added afterwards, as the cultivation and yield of the estate increased and additional accommodation became necessary.

4. *Preparation of the soil; sowing of the seed.*

Immediately after the jungle has been burnt, the land

Preparation of the soil.

should be hoed to a depth of eighteen inches, and all the roots carefully taken out and piled in small heaps to dry, after which they should be burnt prior to the second hoeing, when the soil must be well pulverized to enable the planter to transplant with greater ease and more security. If the undulations of the land permit, the plough and harrow might be substituted with advantage for the hoe on this second occasion, both as a matter of economy and expedition, but the land must, in the first instance, be carefully hoed and the roots extracted as that could not be done with the plough. After the soil has been prepared as above described, a hole one foot deep and nine inches broad should be dug at each stake for the reception of the transplant.

Sowing of the seed.

The seed, immediately on arrival at the Factory, should be taken out of the bags or boxes in which received and placed in damp beds six inches deep, which ought to have been carefully prepared before hand for its reception. The mode of stowing the seed is, by depositing a layer broad cast as close as the seeds will lie and sprinkling them with soil to the depth of an inch, to be again succeeded by a layer of seed and an inch of soil until the seed be filled up, when the surface should be lightly watered and covered with mats, straw, or grass, in order to protect the soil from the influence of the sun, which would heat the bed and cause the seed to germinate too quickly, while the object is merely to swell the seed, prior to permanently planting it at the stake or transferring it to the nurseries.

5. *Nurseries.*

Time and site for forming Nurseries.

The time for forming Nurseries is November, and they should be made on as level and low a site as possible, so as to be near water, care being taken that the soil be good, and that it be well turned up to a depth of two feet, thoroughly pulverized, every root and stump extracted, and formed into raised beds, five feet in breadth, with a space of two feet between each bed, to give a passage for watering the nurseries, the earth taken therefrom being thrown on the beds to raise them to a height of six inches to prevent inundation in the event of any heavy fall of rain. The sides of the beds must be hardened by beating so that they may not be easily washed away or trodden down. Should the beds be inconveniently long, cross paths might be made at intervals to allow of greater facility in watering and tending them. The whole should be fenced round to protect them from cattle or wild animals, and watchmen must be kept up night and day to drive off squirrels and other destructive animals, as rats, monkeys, porcupines &c.

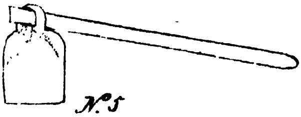
Mode of preparing nursery-beds.

Cattle and animals to be guarded against.

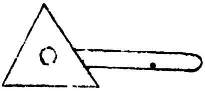
If the seed be Hybrid or China and it be intended to transplant it during the first season, it should be sown in rows four inches apart with a space of two inches between each seed; but, if the seed be Indigenous, it should be sown five inches apart each way, which will allow of the removal of the plants without injury to the roots during the second season. Great care must be taken not to sow the seed deeper than one inch, or one inch and a half, as that depth is quite sufficient for all purposes. Immediately after the seed has been sown, it should be watered and thickly covered over with straw, so as to retain the moisture and protect the beds from the sun's rays, nor need it again be watered till the plants spring up, when the straw may be thinned and the plants daily watered. No weeds should be permitted at any time, and constant care and attention must be bestowed on the seedlings till they attain sufficient strength to render further anxiety unnecessary. Recent experience has proved that the erection of artificial shade,

Mode of sowing Hybrid and China Tea-Seed.

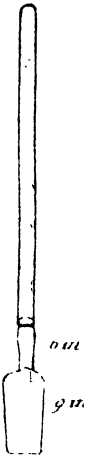
Indigenous.



N.° 5



N.° 4



N.° 6

as formerly practised, is not needed, but, on the contrary, is highly deleterious to the young plant, by rendering it too delicate and subjecting it, on removal of the shade, to too sudden a change, while early exposure to the sun renders it hardy, light and air being essentially necessary to its well being.

Should the young seedlings be attacked by caterpillars, ants, or other small insects, they may be speedily exterminated by turning a few domestic fowls into the nursery, as from close observation it has been proved that they do no injury to the growing plants.

6. *Transplanting.*

Time for transplanting.

Transplanting should never be attempted until the rains have fairly set in, and even then, the indications of the weather must be carefully watched, lest any break should occur, as a few days drought would, at this particular time, scorch up and kill the plants. The best day for transplanting is that on which a drizzling rain is falling; or even a dull cloudy day, with the prospect of further rain, may answer; but if the seedlings have been removed from the nursery and a change should take place in the weather, it would be better to put them into a dark and cool room with earth round their roots than attempt to plant them out, and they have been known to keep in this way for several days without sustaining the slightest injury.

Removing seedlings from the nursery.

In removing seedlings from the nursery too much care cannot be taken, as the life and health of the plant entirely depend on the manner in which this is done. The best mode is, to dig a trench at the end of the bed, from which the seedlings are to be taken, to twice the depth of the tap-root, and then remove each row in succession with a circular spade (fig.* No. 3) or gouge, laying them in circular flat baskets with their roots to the centre, covering these latter with earth to protect them from exposure.

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* Plate, II.

Mode of planting seedlings.

On arrival at the place where they are to be planted, hole sufficiently large to admit the tap-root of the seedling should be made with a dibble in the hole already prepared, as before described under the head of "*preparation of the soil,*" which directed that "a hole one foot deep and nine inches broad "should be dug at each stake for the reception of the tea-"plant."

New Kind of "dibble" to be used in transplanting.

The *dibble* used in this process, namely in making a second and smaller hole within the first, should be eighteen inches long with a diameter of three inches, tipped with steel or iron, and a chisel edge, instead of a sharp point, as the latter is liable to create a vacuum under the end of the tap-root, from the earth, unless well pulverized, being unable to reach down to the extreme end of the hole, and thus causing the death of the plant; but this danger is obviated by the use of the dibble now suggested (fig.* No. 7), as the hole can be made the same size at the bottom as at the top by turning the dibble round two or three times, which can easily be done by its cross handle, as it gives a great purchase on the instrument.

Manner of holding the transplant.

In transplanting, the plant should be held in the hole by one hand and the earth finely crumpbled in with the other, care being taken to press it down lightly round the seedling until firmly set. The object of digging the *first* hole to a depth of one foot as above described is, to prevent the lateral roots from being too near the surface when the plant arrives at maturity which would render them liable to be cut and injured while hoeing, whereas, by adopting the plan herein recommended, the hole will, in the course of the first rainy season, gradually and naturally fill up, by which the health of the plant will be secured.

---

* Plate, II.

7. *Hoeing and Weeding.*

Hoeing to be performed every two months.

Hoeing should be constantly (say once in every two months) performed to a depth of at least eighteen inches, and, on each subsequent occasion to *transplanting* (prior to which two hoeings have been directed) the earth should be turned over in large clods with the roots of the weeds exposed, as they will thus die more rapidly, and return to the soil, by being left on it, all the nourishment they have extracted from it.

Little occasion for weeding.

If the above practice be followed, there will be little occasion for weeding; but, should such a necessity arise, it ought to be performed by the hand, or with the weed-cutter (fig.* No. 4,) of which a sketch is given, and all the weeds taken up should be either removed to a manure pit or buried between the lines as, by being left on the ground, they are liable to harbour insects which would attack the tea plants.

* Plate, II

Loosening the soil round the roots of the tea-plants.

It is very advisable to loosen the soil occasionally round the roots of the tea-plants, so as to give a free admission of air and moisture, and for this purpose the *hand-hoe* (fig.* No. 5,) is best adapted, as, in the use of the regular hoe, great danger is incurred of cutting the lateral roots of the young tea-trees.

* Plate, II.

Ploughing, where practicable, to be resorted to in preference to hoeing.

In all cases, where practicable from the lay of the land, ploughing should be resorted to in preference to hoeing as being more economical, and the plants having been set out at right angles, the plough can be carried transversely throughout the garden and most effectually perform the work required.

(N. B.—A sketch of a new plough (fig : Nos. 1 and 2,) that would prove very useful is given in the Appendix.)

8. *Pruning.*

This is a matter on which much discussion has arisen and much diversity of opinion prevails, as, on the successful result of it, mainly depend the luxuriance of yield of the tea-crop and the ultimate welfare of the plantation.

First year.

In the *first* year it is sufficient to *top* the plant, which is done by nipping off the upper green stem with the fore finger and thumb, as this arrests its upward, and promotes its lateral growth.

Second year.

In the *second* year the plant ought to be cut down to a height of 21 to 24 inches, and all the small lower branches stripped off to eight inches above the ground, by *breaking*, not *cutting* them, which will prevent their again shooting forth. Much depends on the care with which this is done, as, if neglected, or carelessly performed the danger to the plant of effecting it in the succeeding year will be increased, while a free circulation of air, given at this critical time, greatly benefits the tea-tree, and the removal of all branches, to a height of eight inches from the ground, lessens the liability of the plant being attacked and destroyed by insects, which must result if the branches be allowed to trail on the ground and dirt to accumulate round the stem.

Third year.

In the *third* year, the pruning should be performed by *trimming* with the *knife* (in preference to the *shears*, which, unless used by those who throughly understand them, only break and jag the plant), so as to give the lateral branches an upward tendency: all straggling branches should be closely trimmed and a conical form given to the plant.

Fourth year.

In the *fourth* year, the branches should be neatly trimmed round the sides of the plant, and cut down to from 24 to 26 inches in a flat, table like shape, the secondary laterals being thinned out from the centre, if the plant be not sufficiently ventilated, as too dense a growth in-the heart is highly injurious, care being at the same time taken to remove all the cuttings from off the plant.

Fifth year.

In the *fifth* year, much the same system may be pursued, with the exception of the pruning being made more concave towards the centre, allowing three inches below the margin of the bush.

Sixth and succeeding years.

In the *sixth* and succeeding years, the planter must be guided by the requirements of the tea-tree and must exercise his own discretion, bearing in mind that, by cutting away all old wood, he promotes the growth and developement of new shoots, which are essentially required for manufacturing purposes.

9. *Insects injurious to the tea-plant and best preventive measures against them.*

The paddle cricket.

The most destructive of all insects to the tea-plant, and particularly to the seedlings, is the "*paddle-cricket,*" which burrows itself to a great depth during the day and makes its raids on the plant at night, nipping them off close to the ground and destroying, in this manner, thousands of seedlings in one night.

Methods of killing it.

There are only two methods of destroying these insects, namely by either digging them out of their holes, or by inserting poison (cyanide of potassium) therein and closing up the orifice with a stake firmly driven down it.

Other insects.

Catterpillars, bugs, ants and various descriptions of the beetle-tribe are also somewhat injurious, especially the white-ant, but not to such a degree as the paddle-cricket, and the only mode of guarding against them is by keeping the plantation perfectly clean and the plants free from dead wood.

The weevil.

There is also a *weevil*, which has been found to destroy the tea-plant, by piercing the stem and boring a complete circle round it just at its junction with the surface of the soil. A plant attacked by this insect shows signs of sickness by drooping and by its leaves turning yellow, when an application of lime and water, or white wash, round the stem at its base may occasionally recover it, by killing the insect and thus removing the cause of the plant's decay; but if not taken early in hand, the certain death of the plant must ensue.

10. *Plucking of the leaf.*

The plucking season commences about the end of April and continues till the end of October, during which time a series **Season.** of flushes occurs at intervals of twelve or fifteen days according to the weather and thus twelve crops of leaf may be gathered in one season. The plant should not be plucked before the third year, and then only very lightly, as over plucking will render it weak and sickly.

The yield from an acre planted at five feet apart should **Yield.** be two hundred and eighty pounds of green leaf, or seventy pounds of manufactured tea in the third year; double that in the fourth, and quadruple that in the fifth year, though care and high cultivation will give even a much larger return, as both in Assam and Cachar seven maunds, or 560lbs. of manufactured tea have been obtained from one acre.

The most advantageous method of plucking is to divide **Mode.** the Coolies into three gangs, in number according to the flush to be gathered, each gang to be supervised by an intelligent Sirdar. The "Pekoe" gang should be composed solely of women and children as their hands being more delicate are better adapted for nipping off the convoluted bud and its two expanded leaves, from which "*pekoe*" is made. This gang should be followed by the "Souchong" pluckers, who gather the next two leaves, and they again succeeded by the coarse tea, or "Congou" gatherers. The object of this division of labour is to keep the leaves separate for the manufacture of each class of tea, when brought into the factory for manipulation. Another advantage gained by this careful classification of the raw leaf is, that it prevents the coarser and harder leaves from breaking the leaves of the finer teas during the process of rolling, and further more obviates the necessity of so much sifting as would be required if all the teas were manufactured together.

One caution should be impressed on the two last gangs of gatherers, namely that, in removing the leaves, they do not nip off the stem as well, but pluck upwards, leaving about a quarter of an inch from the eye or bud for the reproduction of fresh shoots. Each Coolie should be furnished with a small basket suspended from his neck by a band, into which he should throw the leaves as gathered, and, when filled, transfer them to a larger basket, which ought to be carried to the factory without delay, as exposure to the sun, while in a large mass, tends to heat and spoil them. All plucking should, if possible, be finished by noon, to permit of the manufacture of the leaf on the same day it is gathered, as it improves the quality of the tea both in respect to colour and flavour.

11. *Labour: management of, apportioning of works, payments, advances.*

Labour, local and imported.

Local labour.

Labour consists of two classes, local and imported, and each class requires a separate kind of treatment. The imported labourer is dependent on, and a part and parcel of, the estate until the expiry of the term of his contract, while the local labourer is a free agent and works when and where he likes.

Imported labour.

Imported labour is a medley of all classes and all castes, and the men are, in consequence, most difficult to manage at first. Some are of a lively disposition, others sullen and sulky; some are active and others lazy: some are contented, others again are discontented; some there are (but few) respectable; others there are (and many) that are the refuse of all the jails in India; and several who are old mutineers and would breed discontent wherever they went. However it is the duty as well as the interest, of the planter to treat all with kindness and consideration and to endeavour to reconcile them to their new home on their arrival at his factory and to make them understand that by justice and justice only between employer and employed, they are to be governed. Once establish a mutual confidence, and the imported labourer overcomes his repugnance to locate himself in the jungles.

Management of labour.

The duties of the labourer are multifarious, and it would only be a recapitulation to enumerate and define them here, as the whole of the duties pourtrayed in this essay are the works of the Coolie; but the duties of the Master to his Coolie are not so fully understood as they ought to be, so it may not be out of place to define them here as succinctly as possible. First, then, he must study the character of the individuals he has to deal with,—their caste—the prejudices of that caste—and how not wilfully or unwillingly to offend those prejudices; for instance, no caste should be compelled to live with another, but each should be separately housed. Secondly, he must pay every attention to the sick and keep up a regular supply of medicines and medical attendance. Thirdly, he should see that his Coolies are supplied with good and wholesome food, and that they are not cheated in quantity or price. Fourthly, he must be careful that the water they drink be pure, as the health of his Coolies chiefly depends on this, for more disease is engendered by bad water than by any thing else. Fifthly, he must see that his Coolies are paid their just dues, and as soon after it is due as possible.

If these suggestions be carried out, few Coolies will care to desert their employers, but, on the contrary will, as has already occurred in many instances, re-engage after the expiry of their term of contract.

Apportioning of work.

The Coolies should be divided into gangs under the supervision of a Sirdar, and the ordinary work of the garden should be portioned off to each gang at the rate of one man to an acre. This can easily be done, as the garden will have been divided off according to its natural formation. If the land be flat, each gang of twenty men could be allotted twenty acres in one patch, numbered stakes being placed to demarcate its boundaries; but if the garden be detached, the spaces so separated could be worked by the given number of men according to the acreage, under one or more Sirdars. A certain percentage ought always to be allowed for sick or absent men out of a reserve gang kept for that purpose as supernumeraries. Each gang should be chosen as much as possible of one caste and located together in their lines. The factory-hands should be kept on the factory and have a somewhat higher rate of wages as, by this means, they would be induced to be more watchful and careful in the performance of their various duties. Field labour, especially hoeing, unfits them for the delicate task of manipulating the leaf, and alternate exposure to the outer atmosphere and the heat of the factory frequently engenders disease. All the gangs should be numbered and mustered every morning, each cooly's name being called from the Muster Roll, and their daily task apportioned to them with instructions to each Sirdar. The work accomplished should be daily measured whether in field or factory and the coolies informed of the amount each had earned, which should be then and there written down by the Muhurirr (Native writer) who ought to be appointed for every hundred coolies. Should any dispute arise, the work ought to be immediately measured in the presence of the coolie and the Jemadar in charge of his division, whose duty it is to supervise, under the orders of the European in charge, the whole of the division placed under his control.

Payments.

It would at all times be advisable to pay the coolies monthly, and as soon as convenient after the expiry of each month, as this regularity gives them confidence in their employer. A Savings Bank system ought to be introduced into every factory, and statements carefully kept of each man's account. Small advances might be made at any time during the month, to coolies requiring to purchase cattle or other articles needed by them to add to their comfort, as it is more than probable that, if comfortably settled, they will renew their agreements with their employer, a great desideratum with the present high rates for imported labour.

Advances.

Advances for local labour might be safely made to such respectable landowners as offered to procure coolies at the current rates of the district, such security as they could tender being accepted for the due fulfilment of their contract; or work might be measured off to them to be performed by their own Ryots at a certain fixed rate to be paid to the landowner, he making his own arrangements with his tenants. The advance system, th[illegible] a bad one, has been so long established in India that [illegible] can now do away with it, and, though, occasionally, [illegible] sums may prove irrecoverable, yet any loss in this respect is more than compensated by the additional labour attracted to the estate, to say nothing of the saving effected, on the other hand, by not being obliged to import all the labour required.

Contract Law.

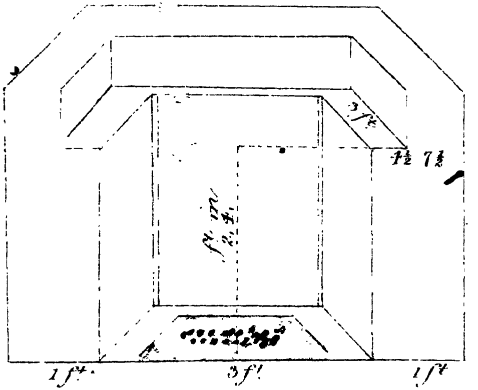
The great need of a contract Law, that has been so long felt, is about to be supplied and may prove advantageous to all parties.

12. *Manufacture in all its branches, with suggestions for the machinery best adapted for the purpose.*

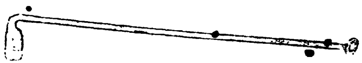
Mode of manufacturing black tea.

The plucking of the leaf having been described in a preceding paragraph need not here be again commented upon. On delivery of the

D.



½ inch to 1 foot.



leaf at the factory it is first weighed and then strewed thinly on the shelves which line the walls of the Tea-House for the purpose of cooling, when twenty pounds should be issued to each roller, who places it out in the sun to wither, beating and **Withering.** tossing it with his hands, and picking out all coarse and useless leaves. After the leaf is sufficiently withered (which can be ascertained by compressing a handful; if, on opening the hand, the leaf has lost its elasticity it may be considered withered) it must be taken back into the tea-house, cooled and rolled on the tables in small portions, **Rolling.** being formed into balls until all the leaf has been rolled, when the first ball is again rolled and all obstinate and unrolled leaves picked out to be wards mixed with the coarser teas. The leaf, being now ready for the pans is transferred to them and the roasting **Roasting.** process commences, the pans being kept at a temperature of 180°. After being roasted for ten minutes, during which time the leaf must be constantly stirred and tossed about to equalize the roasting and prevent its being burnt, it must be again rolled and placed in covered baskets to be a second time passed, for a quarter af an hour, through the roasting pans at a higher temperature, viz. 212°, when it must be kept stirred with two pieces of wood, the heat being too great for the hand. After being taken out of the pans, it is again rolled, while still hot, and spread out on mats to cool, when it is ready for the drying process, **Drying.** which is effected in trays or sieves placed over the "*choolhas*" or charcoal fire places (shewn in fig. D. Plate III.) and occupies a period of five or six hours, or until thoroughly dry when it is despatched to the Packing-House **Orange Pekoe, Souchong, and Congou varieties.** and classified into orange Pekoe, first and second Souchong, and first and second Congou, by being passed through the winnowing machine and sieves, when it should be stored in the large bins already mentioned, until a sufficient quan-

Bohea.

tity be prepared for packing. The refuse of the manufacture of the above teas is called "*Bohea*" and consists of all the coarse, brown and unrolled leases, which have been hand picked. This tea is of little value for export, but may find a ready sale in the local markets.

Flowery Pekoe.

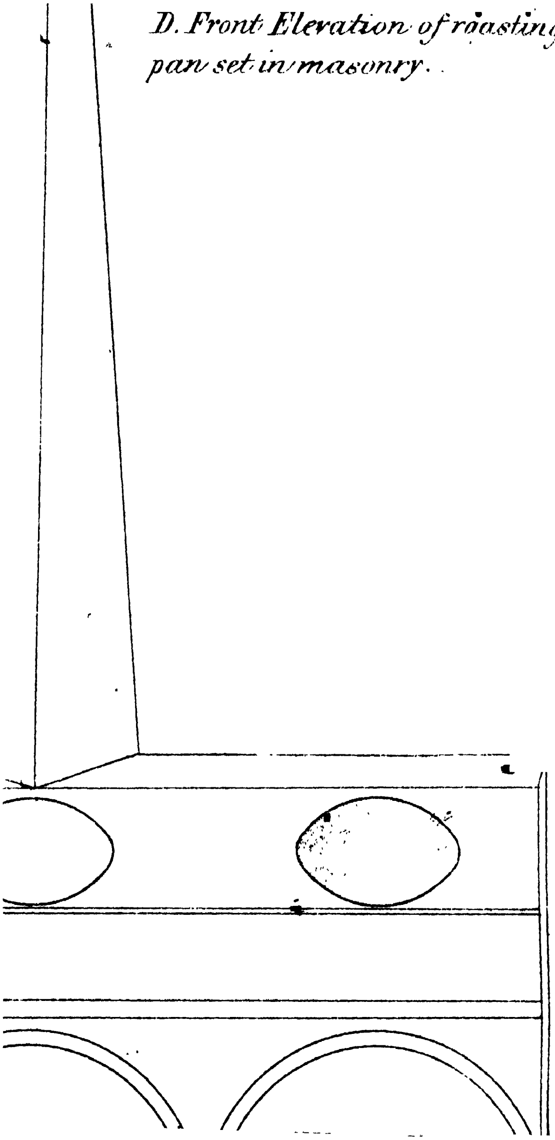
Flowery Pekoe is manufactured quite differently to the above teas, being submitted to neither the rolling nor roasting processes. When the leaves (to be plucked as described in a preceding paragraph), from which this class of tea is made, are brought to the factory, they are thinly spread upon mats and exposed to the influence of the sun for twenty minutes; after which they are cooled in the shade and again exposed to the sun in larger quantities, until the leaf has well shrivelled, when it is thinly sprinkled into flat sieves and placed over slow charcoal fires in the "choolhas" above mentioned, being at the same time covered up to keep in the aroma. Prior to being finally packed, this tea must be placed to a depth of five or six inches in each sieve or tray and thoroughly dried which takes about eight hours. The leaf having been carefully plucked in the garden (as advised) by the "Pekoe-Gang", requires neither winnowing, sifting, sorting, nor picking, but should be packed, while hot, as soon as it is ready, the flavour being thereby improved.

Mode of manufacturing green tea.

The manufacture of green tea is a very tedious and lengthy process, nor has it been much practised in Cachar, but the following is a brief description of the mode in which it is performed by the Chinese Tea-Makers employed there.

The young leaves are, as soon as gathered, taken to the factory and immediately spread out to cool, which occupies some considerable time. They are then put into the horizontal pans and submitted to a heat of 150° until perfectly soft and pliable, being kept constantly stirred to prevent their adhering to the sides of the pan; after which they are quickly rolled and made up into balls, in the same manner

D. Front Elevation of roasting pan set in masonry.



as black tea, and exposed to the sun on mats, to dry, the juice being expressed from time to time by the hand. This takes three hours, and they are afterwards transferred to the pans, where they are again heated and constantly stirred until the leaves become perfectly crisp and dry, which will occupy several hours, as it is necessary to bring out the required colour by this process. The more juice that is extracted from the leaves the better will be the colour and flavour of the tea, and this might possibly be more effectually done by machinery* than by the hand. The tea, being now ready for the Packing-House, is submitted to the same processes, as before mentioned in the case of black tea, and classified into Twankay, Hyson, Imperial, and Gunpowder.

Suggestions in machinery.

The present mode of manufacturing tea is no doubt a very primitive one and one that is capable of vast and important improvements especially in the rolling, roasting, and drying processes, which might be advantageously performed by the application of steam. It would be injudicous, and might be considered unfair, for me to descant on the machinery already in operation in Cachar, as it has not yet had a sufficient trial to enable any one to pronounce on its merits, and the inventor, Mr. Gibbon, late of the Assam Tea company, and at present employed as Engineer by the Soorispoor Tea company (Cachar) is about to protect his inventions by a patent.

13. *Box-making, packing, leading, stamping, shipping.*

Box-making.

For the purpose of box-making, light seasoned timber is requisite and, as the boxes should be made of equal weights, it would be advisable to have them constructed by machinery. Saw and dove-tailing mills could be erected for a comparatively small outlay and could be made a source of profit by supplying adjoining estates with boxes. They are indispensable on a large property, where the wood is at hand and the requirements are great, as the same steam power would be available for other factory purposes.

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* A press for this purpose is given in Plate III Fig. F.

Packing

Packing requires much care and attention, as if negligently done, the tea is liable to be injured. After the tea has been finally dried it should be put into the lead lined wooden boxes previously prepared for its reception, the lining having been carefully examined to see that there are no holes in it. The tea should be shaken down into the box, so as to make it pack tight, but on no account should it be pressed down, as that would crush the tea and thereby detract from its market value. After the tea has been soldered up, the lid of the box should be *screwed* on, not *nailed*, as the nails are liable to penetrate the lead and injure the tea by admitting the air. The box may now be weighed, entered in the factory-book, marked and sent to the Godown.

Leading.

The lead is soldered on a mould, the exact size of the interior of a tea-chest, after which the box is carefully placed over the mould, turned over, and the mould cautiously removed when the box is lead-lined and ready for the reception of the tea.

Stamping.

Stamping is at present done by stencilling, or painting over a perforated metallic plate the required letters and numbers, defining the name of the factory where produced, number and class of tea, all of which particulars are with the date entered in the factory-book and accompany the boxes when despatched, in the form of an Invoice.

Shipping.

In shipping teas by boats from the factory to the port of export, care should be taken to dunnage the boat to the bottom with light wood ten inches high and at the sides five inches, to prevent any damage from water. The roof of the boat ought to be well covered in with mats so as to be perfectly water-tight. But it is always better, where practicable, to despatch teas, which are so valuable and perishable a cargo, by steamer.

14. *Seed-plucking, drying, packing, transport, best mode of preserving, application to economic purposes when not saleable.*

Seed. There are three descriptions of seed, namely Indigenous, Hybrid, and China, but all require the same treatment as they are all equally of a perishable nature.

Plucking. The time for seed-plucking is in the months of October and November, when the seed is thoroughly ripe, which is known by the brown appearance of the capsule. There are many seeds that never ripen on the tree from the sun not being able to penetrate to them, and these should be left to the last.

Drying. After gathering the seed it should be placed on airy shelves or platforms in a cool, shady-place, until the capsule opens, when it can be shelled by the hand. On no account should seed be exposed to the sun, as it causes fermentation and its consequent destruction.

After being shelled, the seed should be left on platforms, exposed to the air, to enable it to dry, being turned over night and morning for five days, when it may be packed in perforated boxes or guny-bags with small pieces of charcoal the same size as the seed and to half its bulk. Seed packed in this manner will keep for three months, as the charcoal will absorb all the moisture given off by the seeds, and thereby prevent decomposition.

Packing.

Transport. Tea-seed ought to be transported with as much expedition as possible, since it is very delicate and liable to damage. Whether despatched by boat or steamer, it ought to be turned over every other day for the purpose of being aired.

The best mode of preserving tea-seed, if intended for des-

Best mode of preserving.

patch to any distance, is packing in charcoal, as described above; but should it be required for planting on the estate where produced, no better method can be adopted than that already advised of depositing it in damp beds until required for use, as it has been known to keep quite fresh in this manner for several weeks, and even should it swell and germinate a little extra care in its removal is all that is required.

Application to Economic purposes, when not saleable.

The oil expressed from tea-seed is fit for all factory purposes and would no doubt become an article of commerce, if procurable in any quantity, though its relative value cannot be estimated, as no export of it has yet taken place. The refuse might be advantageously applied as a manure placed in small quantities round the roots of the tea plants, as it would return to the soil many of the properties originally extracted from it. The oil cake might also be found useful for cattle, as the ripe nut is greedily devoured by deer and pigs, which leads to the inference that it would not be distasteful to domestic cattle.

15. *Management,—Accounts, forms, adjustment of advances.*

Management.

There is no more important subject than that of management, as no success can possibly be obtained without a thoroughly organized system, but this must be governed, in a great measure, by the size and requirements of the plantation. The Manager ought to be a person who has a perfect knowledge, both theoretical and practical, of his business, and should be ably seconded by qualified establishments, European and native, to supervise each branch. One European assistant is required for every two hundred and fifty acres, and the factory work ought to be carried on under the personal superintendence of Europeans or Chinese, as this is the most important duty required and one in which competent persons should be employed.

Accounts, forms.

The forms of account, both for factory and field, appended hereunto, will explain themselves, as they are drawn up with a due regard to simplicity and every contingent requirement on a large or small estate.

Adjustment of advances.

The subject of advances has been already commented upon in another paragraph, and there seems no difficulty in adjusting them, if proper care be taken to deal with respectable individuals, compelling them always to furnish security for the amount advanced, when, should they break their engagements, recourse must be had to the Courts of law, and little, if any, loss will be sustained by the Concern.

Having now concluded my observations on the several points raised by the Agricultural and Horticultural Society, which are the result of personal experience, I will only express the hope that my efforts may meet with approval and lead to further enquiry on this most interesting question.

CALCUTTA :
1st *March*, 1865.

Field Haziree Sheet for the month of 186

NAME OF GARDEN.

Date.	CULTIVATION.											CLEARANCE.					BLOCK ACCOUNT.				GENERAL.					HAZREE.	VALUE.		
	Hoeing.	Weeding.	Cutting Stakes.	Staking off.	Transplanting.	Nursery work.	Pruning.	Clearing.	Holing.			Jungle.	Shade.	Station.			Roads.	Bridges.	Tanks.		Boatmen.	Messengers.	Porters.		Extra.	Total.	Rs.	A.	P.
1																													
2																													
3																													
4																													
5																													
6																													
7																													
8																													
9																													
10																													

Certified by

Asst. in Charge

Signature of Manager.

Date

Factory Haziree Sheet for the month of 186 .

NAME OF GARDEN.

Date.	Plucking.	Rolling.	Sifting.	Roasting.	Drying.	Picking.	Packing.	Tea Makers.	Asst. Do.	Jemadar.	Chowkedar.	Carpenters.	Sawyers.	Tinman.	Black Smith.	Fuel.	Charcoal.	Oil.	Paper.	Baskets.	Repairs.	Total of Daily Hazree.	Value.		
																							Rs.	A.	P.

Manufacturing Book for the month of 186 .

Date.	Coolies.	Leaf.	Whence	Tea Made.	Tea Packed.	Bar.	Ther.	Rain.	Remarks.
		lbs.	Plucked.	lbs.	lbs.	In. Ths.		In. Ths.	
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
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16									
17									
18									
19									
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21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									

Signature.

Date and Garden.

Invoice of Tea Stored.

Date.	No. of Boxes.	Class.	Nett. lbs.	Tare. lbs.	Gross. lbs.	Remarks on Packing.
1						
2						
3						
4						
5						
6						
7						

Daily Cash.

Page.	Folio.	Date and Particulars.	Rs.	As.	P.	Rs.	As.	P.	Classification.

Pay Abstract for the month of 186 .

Particulars.	Advance.			Balance.			Total.		
	Rs.	A.	P.	Rs.	A	P.	Rs.	A.	P.
Establishment, European,									
Ditto Native,									
Field-work, Imported,									
Ditto Local,									
Factory, Imported,									
Do. Local,									
Purchases as per Vouchers,									
General Charges,									
Miscellaneous Ditto,									
Rent,									
Taxes,									
Stamps,									

Manager.

Dated this day of 186 .

Dr. *Cash* *Per Contra* *Cr.*

Date **Signature.**

Cr. *Name of* *Dr.*

No.

Date.	Page.					Date.	Page.				

Advance Account.

Date.	No. of Bill.	Advance.	Unrefunded			Particulars of Advance.	Since made.			Total.			Refunded.			Particulars of Refund.	Unrefunded.		
			Rs.	A	P.		Rs.	A.	P	Rs.	A.	P.	Rs.	A.	P.		Rs.	A.	P.

Sirdar and Duffadar's Muster-Book for the year 186 .

Month.		**Anser Meah.**				**Bootah Meah.**				**M. * * * * ***				**B. * * * * ***			
	Days of week.	**Coolies.**	**Rs.**	**A.**	**P.**	**Coolies.**	**Bs**	**A.**	**P.**	**Coolies.**	**Rs.**	**A**	**P**	**Coolies.**	**Rs.**	**A.**	**P.**
1	Sunday, ...																
2	Monday, ...																
3	Tuesday, .. .																
4	Wednesday, ..																
5	Thursday,.. ..																
6	Friday, .. .																
7	Saturday,.. .																
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	

A few observations on the Cultivation and Manufacture of Tea in the Darjeeling District.—By W. C. MULLER.

(PREMIUM—FIVE HUNDRED RUPEES.)

Selection of Land.

The Western slopes are the best adapted to Tea cultivation, as they retain the moisture longer, and are generally better watered and more fertile in other respects. The tea plant will *grow* in any soil, but *flourishes* in a light sandy loam. It is essentially necessary whatever the surface earth may be, that the *subsoil* consist of a yellowish earth, composed of clay and sand, sometimes passing into pure sand; the former gives sustenance to the plant, holding rain and moisture in deposit, and the admixture of the latter, renders the soil porous, and of such consistency that the tap root can easily penetrate it without injury to the spongioles.

There are two descriptions of soil to be specially avoided.

1st. The stiff red, almost crimson clay, impervious to rain, and which cakes, and hardens under the sun.

2nd. The loose, friable micaceous, black-looking earth, intensely dry and hot, which although it may in a favourable, that is in very rainy season give apparently healthy seedlings with *stiff* blackish leaves, will ultimately produce a stunted scant-yielding tree. A sandy loam, though stony, is far preferable to either of the above.

I have heard some planters remark that they have seen the best trees on stony soil, and that consequently stone, instead of being a disadvantage was decidedly beneficial to the Tea tree. I am inclined to think that too hasty an inference has been drawn from isolated facts and that the *merit* due to the soil has been ascribed to the presence of stone. Stone undoubtedly retains heat, in a measure prevents the wash of soil, and in fact often retains rich earth in crevices; but these are, as far as I am aware, all the advantages it possesses.

I should give the preference to good soil without it, and consider the first of the above enumerated advantages as decidedly disadvantageous in unfavorable soil.

Elevation.—The Tea plant grows as a stunted shrub at an elevation of 6,000 feet above the level of the sea. From 1,200 feet to 3,800 feet it flourishes, but the best climate is found from 3,000 feet downwards. Its growth and general appearance on favourable soil in some of the valleys of Darjeeling, is fully equal to anything I have seen in Assam.

Cold weather operations.

Forest clearances.—Planters are at variance as to the advisability of allowing any trees whatever to remain within that portion of the land intended for tea cultivation. The argument against it is that the shade of such trees must necessarily be injurious to the Tea plant, depriving it also of the quantum of rain it would otherwise receive.

My observation shews, that the seedling decidedly suffers, when it is under the *immediate drip* of a *tree*, but not otherwise; on the contrary I find most prominently that a transplanted seedling receives a decided benefit from partial shade. The subject I think admits only of the following argument:—

Judging from the localities and situations in which the indigenous tea tree has been found, is the conclusion reasonable which infers that partial shade is injurious either to the growing plant from seed or to the transplanted seedling?

Do the general advantages derivable from occasional clumps of forest and bamboos interspersed throughout a plantation counterbalance the loss sustained by relinquishing such land, for tea purposes?

The indigenous Tea tree of Assam is found in close forest running up occasionally 50 feet high, a natural consequence of its crowded situation. A wild *untutored* tree, capable of producing seed and giving leaf, though not to the extent, or so advantageously as the tree of cultivation. But where not overpowered by other forest trees it is most certainly capable of propagating its species. Of these so propogated, two years after germination, but a few remain, the greater portion dying for want of solar influence and space to rear themselves. But invariably around these indigenous trees, and *more markedly around these trees in an advanced plantation whose seed has been allowed to fall and germinate,* we find seedlings, especially *healthy and numerous, where immediately under the fostering shade of the parent tree.* May we not safely conclude from this the beneficial effect of shade to the plant reared from seed?

With reference to the transplanted seedling I would beg to refer those holding views contrary to mine to any botanical work treating on the transplanting of seedlings with a tap root. My opinion derived both from inference and observation is, that shade to a certain extent is highly beneficial to the plant during its infancy: rear it as nature rears it and then educate it. The trees left for the purpose need in no way lessen the number of plants per acre.

This amount of shade then I consider necessary for the first two years, when the trees may be felled without any injury to the tea plant in the operation. In Assam I have seen a goodly proportion of forest standing barked for three years and then felled.

2nd. Setting aside all idea of the picturesque and the unsightly appearance of a denuded hill side in May without one particle of grateful shade, and taking up the question in a purely speculative light, I argue that a whole plantation benefits from occasional clumps of trees and bamboos, and that these benefits amply counterbalance any loss caused by the sacrifice (if it can be called a sacrifice) of land for such purposes. The attractive powers of forest for rain clouds are so well known, that it is unnecessary for me to dwell upon this subject.

The tea plant delights in moisture, and you have only to watch the mist rising from the valleys and creeping along the forest clad sides, *avoiding as it were the clearances*, to be convinced of the importance of having so attractive an agent in the vicinity of tea plantations.

I would always leave a belt of forest on the tops of ridges and at the head of all plantations. I presume every planter will admit that it is highly injudicious clearing away the forest from the heads and sides of "Joras." Yet I could point out plantations where not a single forest tree has been allowed to remain, and where rocky steeps and "Joras" have been denuded equally with the culturable land. This is greatly to be deprecated and if only for the sake of the employés on a plantation the Government might I think safely legislate on this matter, and take not only prohibitory but protective measures, such as replanting, for the preservation of our hill streams and springs.

Operations.—Commence from your lowest elevation and work up to your highest.

Get rid of all your underwood first and then bark such proportion of your trees whose girth and nature will admit of your eventually using for factory purposes. Fell these close to the ground, cut into lengths with a crosscut saw, and pile. If you are of opinion that partial shade is not injurious you will of course leave a certain proportion of these barked trees to be felled subsequently. The remaining forest fell close to the ground and fire when practicable, as this operation will, instead of injuring, be beneficial to the piled timber. The following woods, are useful, Chestnut Oak, Toon and Magnolia. The wood of the Chestnut makes the best charcoal, shingles and beams; Oak may be used for the latter where not placed in immediate contact with the earth; Toon and Magnolia are suitable for boxmaking.

There are always portions of land in your cultivation "waste" and which it would be folly to put under tea, such as the sides of "Joras" very rocky and very steep inclines, upon which the timber might with advantage be piled, supposing you cleared such places of forest, otherwise, you would have to reserve plots here and there for this purpose.

The ground having been cleared of forest in such proportion as the planter deems advisable he will commence cultivating. Hoe your land throughout to the depth of ten inches removing about two-thirds of the stumps; the remainder may be left with advantage to rot.

Collect and burn all that will burn; the best manure for the tea plant is wood ash. Where the planter has the command of labor a second and third but higher hoeing is advisable to render the ground sweet. The plantation can then be staked according to the disposition of the land, the "Dherries" made and roads laid out. If it is intended to plant out at once with seed, the above operations ought to be completed by the end of November or middle of December at latest; if however the system of transplanting from nurseries be adopted, the planter will have ample time until the rains in June.

Pegging or Staking.—Here arises another vexed question. Which system of planting do you purpose adopting, the *narrow* or *broad?* What area of your soil do you consider equivalent to the production and sustenance of a good tree, and what sufficient for the admission of your leaf pickers, who not over careful, are apt to break off any protruding branches. There are advocates for the broad system 6 × 6 and 5 × 5—or the narrow 6 × 3.

The quality of the soil I am of opinion ought to be the sole guide in this matter. "If your tea trees do not grow and bush rapidly, your only hope of getting large returns is to plant closely,"—say some planters. Their argument virtually being, that poor soil requires closer planting than good, so as to equalize in some measure their respective produce. One can see at a glance the fallacy of such reasoning, the evident sacrifice of quality to quantity of *trees*, not produce. Again, supposing that equalization of produce resulted from such close planting on a poor soil, is the exhaustive system desirable? Do you require a permanent or only a temporary supply of leaf? I have found good soil fully equal to 6 × 3, or 5 × 5, this distance admitting also of free cultivation and leaf picking; on indifferent soils I would recommend 6 × 6.—In fine, I submit that the broad system is a necessity on poor soils, and the narrow system may be advantageously adopted on rich. There is a certain amount of nourishment which the tea tree derives from the soil, and most certainly a larger area per tree of indifferent soil is required than of good.

Whichever of the two systems the planter may adopt he cannot pay too much attention to the lining and pegging.

Pegs.—The pegs or stakes usually made of bamboo or any convenient wood, are 2½ feet high by ½ inch in diameter, firmly fixed in the ground at regular intervals, so that the plantation may present an uniform appearance. Where the slopes are gentle the lines ought to run with the slope of the hill, but where steep across the slope.

Dherries.—The pegging completed the next step is to prepare the land for the reception of the seed, or seedling as the case may be. Taking the peg for your centre, dig out a hole 2½ feet deep and of equal diameter, leave these "Dherries" open until this has been completed throughout your plantation, and *then* commence filling them in, pressing down the earth firmly and evenly arround your stake. Whether you plant out with seed or seedlings, you will find the above method advantageous as affording every facility to the tap root and spongioles.

Seed-planting.—This is a very simple operation. Some planters when they are doubtful of the germinating properties of their seed soak it, for a few hours previous to sowing, in liquid manure, others cast the seed into a gumlah of water, rejecting or thickly sowing such as float, depending mainly on those which sink.

The seed, if sown as brought from the producing garden, will not require to be pitted, an operation only rendered necessary when you are from circumstances prevented from immediately planting it out. Two holes about 3 inches deep are made in the line one on either side of your stake, in each of these holes a seed is placed. Where you are doubtful of your seed you may make 3 or 4 holes in the line, putting one seed into each hole and carefully covering it up.

Seed-pitting.—A roughly constructed shed is erected on a damp spot; under this your pits are formed, by digging out trenches 4 feet broad by 1½ feet deep; the bottoms of these pits are lined with mats on which a little moist sand is sprinkled; upon this a layer of seeds is lightly disposed, another sprinkling of sand just sufficient to prevent contact; and then another layer of seeds, and so on till almost on a level with the top of the pit. When the last layer of seed is laid, the whole is again covered with mats which also are covered with about an inch of moist sand. A pathway of about one foot in breadth is left between the pits to enable the work people to remove the seeds without trampling upon them. In place of sand, and when procurable, pounded charcoal is preferred. In conclusion be careful in selecting your seed. Lindley says in his *Introduction* to *Gardening;* "In sowing seeds for the purpose of procuring improved varieties, care should be had not only that the seeds be taken from the finest existing kinds, but also that the most handsome, the largest and the most perfectly ripened specimens should be those that supply the seed. A seedling plant will always partake more or less of the character of its parent, the qualities of which are concentrated in the embryo when it has arrived at full maturity". For the above reasons I should at present give the preference to Assam seed.

Nurseries.—Select your land as nearly as possible to the site of your future operations, and where you can conveniently bring water to it by means of bamboo pipes, or a drain cut in the earth. The ground should be thoroughly well dug to the depth of a foot and laid out into beds raised a foot high and 3 feet wide with a pathway between each. The seed is sown at intervals of from 3 to 4 inches and 3 inches deep in parallel trenches about 4 inches apart. Where the seed is very doubtful you may sow broadcast. The objection of course to sowing thickly is the probability of the roots of the seedlings interlacing and their liability to injury in removing. The nursery beds should be watered every 5th day taking great care that too heavy a rush of water be not allowed, otherwise your seedlings may be exposed, or washed into heaps. Watering pots are of course the best for this operation, but when not procurable I have fitted bamboo "Choongas" with the caps similar to the rose heads of a watering pot. With good seed I see no necessity for manuring your beds; I speak advisedly, the more advanced your seedling the greater care required in taking up. We will suppose your nurseries filled by the middle or end of December, by the middle or end of January the seed will begin to shew, when you may water slightly over a week and continue doing so until a shower of rain renders it unnecessary. When seedlings are about 3 to 4 inches high, gently remove with the hand any weeds that may have sprung up, keeping always ahead of the jungle and never allowing it to overpower your nursery.

Transplanting.—This operation requires very great care and the constant supervision of an European. The tea seedling produces a long root about 1½ times the length of the stem, so that supposing your plant to be 6 to 8 inches high the root will extend from 9 inches to a foot in depth. You will at once see then the very great care required in "taking up" and the necessity of having had your "dherries" dug to the depth already mentioned. Should the spongioles of any fibril be injured in taking up a seedling, *cut off the injured part,* it is better that the plant should be forced to throw out new fibril, than compelled to carry on an imperfect circulation by means of a diseased one. Mr. McIvor I note has recommended the invariable practice of cutting the tap root, this however naturally tends to stunt the plant, which is not I think the desirable object.

The chief points to be attended to, in transplanting are ;—

1st. Select a cloudy, or rainy day and be sure that there is a good "joe" in your nurseries, that is, the soil sufficiently moist to permit of easy removal.

2nd. Be very careful in removing from the beds, so that the roots and spongioles may receive no injury; roots consist of the "main roots" which grasp as it were the earth, and the "fibrous roots" which supply the plant with nourishment; great care must be taken that neither of these are injured.

3rd. Plant firmly to enable the seedling to maintain its position and secure a good hold on the ground.

4th. Shading, either artificial or natural, is necessay after transplanting any seedling *which retains its leaves,* the evaporation being greater than the supply, more especially if any of the fibrils have been injured.

5th. *Never allow the collar of the plant to be covered.*

Taking up.—Provide your mallies, or those engaged in this part of the operation, with "koorpas" or trowels, the blades of which should be fully 6 inches broad by 4 inches long. If procurable however use either transplanting spades, or a gardener's "transplanter." These two instruments easily take up a sufficient quantity of earth with the plant without injuring the roots. Let your mallies commence at dawn, insist upon their taking up a portion of earth with each plant and lay lightly in the long shallow baskets.

Transplanting.—Each coolie engaged thus ought to have his own *trowel* and a basket calculated to contain 100 seedlings with earth. When supplied with seedlings he ought to cover them up lightly with some broad leaf such as that of the wild plaintain. Provided with his trowel he will first remove the stake, and dig out a hole, on the average say 1½ ft. deep and from 8 to 10 inches broad; this however depends entirely upon the length of root to which his seedling has attained; putting in the plant with his *left* hand, he will fill in and press down the earth round it firmly and lightly with the trowel in his *right*.

1. Be careful that the tap root is not turned up or bent, and that the hole be sufficiently deep and wide so as to give full play to the main and fibrous roots.

2. Do not attempt to overtask your transplanters. Each plant as a rule requires fully 4 minutes in the operation of transplanting, thus 15 per hour—seven hours=105. I consider 100 are the utmost you should requre from any man, but then, insist upon careful work. Some young, over zealous, planters run away with the idea that every object is attained if they can plant out more seedlings daily than their neighbour, hence one of the many causes of the repeated failures from year to year. The season for transplanting is from the end of May to the 15th August. It may be commenced earlier and protracted later but the above I consider the "safe season." If however you choose to be at the expense of removing the plant with a ball of its own earth and without disturbing the roots you may transplant the whole year round. Out of one thousand plants thus treated during the month of January last I have not lost more than one per cent.

The question now naturally arises which of these two methods, seedplanting or transplanting from nurseries, is the best and safest in forming a plantation.

First then let us consider the advantages and disadvantages of seedplanting.

1st. As the most favourable season for cultivation, and I may say the only *practicable* season for forest clearance is the cold weather, that is from the middle of September to the end of May, and as the seed is ripe by the end of November, you have only 2½ months for these operations This necessitates a larger expenditure at starting, crowding the operations of 8 months into 2½ months.

2nd. Should your seed germinate fairly, your tender plant is exposed to the burning sun during February, March and April. A large establishment is also necessary to keep your "Dherries" free from weeds which would otherwise kill the young plant.

3rd. You avoid the risk of injury to the plant which it may receive in transplanting, but the tree raised from seed is most certainly not a better leaf producing tree than the one raised from a transplanted seedling. I admit however that if expense is no object, and you are prepared at starting to engage an establishment equal to thoroughly clearing, cultivating, and keeping in order your plantation, your vacancies will be fewer than if you adopted the system of transplanting. But you must expect vacancies, and as uniformity of growth and age is a very great object you must have a nursery of seedlings to fill such vacancies.

Transplanting system.—1st. You have eight months of the most favourable weather in which to clear and cultivate your land.

2nd. Every seed that can germinate, will germinate in a nursery and your seedlings receive that care and attention, such as watering and weeding, which it would be impossible to give them when spread over a large area of cultivation.

3rd. All taprooted plants are liable to injury in removal, such injury resulting in vacancies hereafter. Let your transplanting however be done carefully, *slowly* and surely, and the difference of expense between the two systems will more than cover your loss by vacancies.

As uniformity of age is a great desideratum, you can conveniently fill up any such vacancies the *ensuing year* from the surplus seedlings of the preceeding year's nurseries. In fact whichever system you adopt, as I have already mentioned, you should always keep nurseries for this purpose. Where your operations are on a small scale, and seed is cheap and good, I would recommend seed-planting. It is the easier, but more expensive method, too expensive as a rule for adoption where a very large cultivation is intended. Till this season's crop, local seed has been runiously high priced, and planters generally did not seem pleased with the results derived from the importation of Assam seed. I can however state that on three several occasions I have myself brought seed from the Jhorehaut Company's garden in Assam with highly satisfactory results.

General remarks on the treatment of the plant up to period of manufacture.

The invariable practice on most plantations is to keep them as clean as possible by frequent deep hoeing throughout the year.

I have four objections to this system.

1st. The very great loss of soil by wash during the rains.

2nd. The injury done with the hoe to the roots of the seedlings.

3rd. The collar of the plant invariably gets covered.

4th. The total deprivation of shade.

For the above reasons I consider deep hoeing for the first two years at least not only injurious, but a very unnecessary expense.

First then the wash of soil. Little need be said on this head to those conversant with the soil and slopes of Darjeeling, but for the benefit of those who are not, I will simply state that during the very heavy falls of rain in June, July and August, large quantities of earth are carried away even on uncultivated lands; imagine then the result on slopes not perhaps the most gentle where the soil has been constantly turned up to the *depth of* 10 *or* 12 *inches.*

2nd. In hoeing in or near the Dherries, the roots of the plant must sustain injury from the hoe which is by no means a suitable implement for operating with on or near young and tender seedlings.

3rd. If however you only allow your men to hoe between the lines, in deep hoeing they invariably throw a portion of the soil over and around the plant, either burying the collar or forcing the plant to throw out fresh roots above, thereby retarding its growth and stunting the tree.

4th. I have already given fully my ideas regarding the benefit of shade to the seedling.

The following is the mode of treatment I would recommend for young plants.

First year. Never allow your men to weed the "thallees" with anything else than the hand or a very light koorpa or trowel, about 1½ inches wide. The hand alone however is the safest. In October a very light hoeing between the lines is advantageous. The jungle must be piled in small heaps and then fired. The ashes are excellent manure and the smoke drives away myriads of grasshoppers and other insects; but this last operation can only take place under the immediate supervision of an European, if left to the natives to do they invariably burn up the plant also. During the rains keep your "thallees" weeded as before mentioned and cut away the jungle between the lines close to the ground.

During February and March reserve as much jungle between the lines as will give a partial shade to the plant, always keeping the "thallees" weeded as before mentioned.

A second light hoeing and burning is again requisite in April.

This is the *modus operandi* I would recommend for the first two years. During the 3rd year light hoeing is requisite, as often as practicable, in the cold-weather, and jungle cutting between the lines during the rains, still bearing in mind that your thallees must never be touched with the hoe but weeded with the hand or "koorpa."

During the 4th year your seedling will have become a tree. You ought if practicable to give your plantation a deep hoeing, that is to say 8 inches, in September, just before the close of the rains, on every other occasion, when necessary, hoe lightly. If you wish to obtain a good supply of leaf never allow the jungle to get more than 6 inches high during the rains; to ensure this you will find it necessary to give a light hoeing *once a month.*

Pruning.

The objects of pruning are twofold. First to keep the tree at a height convenient for plucking the leaf (this is a necessity;) second, to cut off superfluous wood so as to concentrate the strength of the tree in the *leaf producing* branches, and to admit the sun and air into its interior. The season for pruning is when there is no movement of sap, that is either very early in the spring or in winter. It is usually done at the latter period, and I consider it most certainly the safest time for this operation, as the spring succeeds so quickly on the winter that long before your pruning is completed the sap may have commenced circulating.

The height found most convenient for leaf plucking is from 3 feet 6 inches to 3 feet 8 inches; so that your tree should never be allowed at any time to exceed this height; for this reason you will find it necessary in the 2nd. or 3rd. year to nip off the tops of plants, which are shooting up too rapidly, thus forcing them to throw out lateral branches.

Your object then being to produce leaf bearing branches your attention must be directed to.

1st. Pruning out sickly shoots.

2nd. Pruning equally all round so as to equalize the circulation of sap.

3rd. As the tea plant has a tendency to become very woody, especially in the centre, demanding for this purpose that sap and nourishment which would otherwise be producing leaf bearing branches, cut away the centre stem, if more than 1½ in diameter, down to two feet. Always prune from the centre, this not only admits the sun and air into the interior of the tree, but is the only system of pruning which will produce leafbearing branches and prevent the growth of woody stems. Do not prune too heavily, nature must be aided, not overstrained. If however you are compelled to do so, owing to the excessively woody nature of your trees, during the ensuing manufacturing season you must spare your plants and pluck very lightly.

Sometimes the tea tree produces branches similar to those called by the French "gourmands" and by English gardeners "water shoots." These, though often strong healthy branches, with stems almost as thick as the main centre stem, have a great tendency to produce a "woody" tree, and owing to their proximity to the ground never get fairly plucked. Cut them off, let there be fully 10 inches between the surface of the earth and your lowest branches. Pruning however is a violent operation and should not be carried too far because it is a *convenient* necessity with the tea tree.

Mode of pruning and Instruments.

The branch pruned should be cut as near to the bud as possible without of course injuring the bud. The cut should have a downward slope to prevent the lodgement of water, and that the sun and air may have full influence in inducing the growth of bark. When a *snag* is left, that is a long stem beyond the bud, it not only presents an unsightly appearance, but almost invariably withers.

Hold the branch to be removed in your left hand firmly and below where you intend cutting, with your right hand cut upwards and away from you; let your cut be clean and not jagged.

The best instrument is the pruning knife, but when operating on thick stemmed trees, pruning shears with a sliding joint, or else the French "Secateurs" or cutters will be found useful. The common English shears do not answer as it is almost impossible to make a clean section with them.

The great art in pruning is to make a clean cut and leave no dead wood. I have seen some pruners gather all the branches together in their left hand and then cut off about six inches of leaves and stem above the hand. This is a most barbarous method and reminds one of the scientific barber who put a basin on a man's head and then gave a crop all round.

Manufacture.

Almost every planter has his own pet theory regarding the manufacture of tea. A great deal has been written on the subject and we may yet expect a great deal more. Theory may in a measure assist you, but practice alone will enble you to turn out good tea. The following is the system adopted in the Jorehat Tea Co's factories in Assam.

The process of manufacture from the plucking off the leaf, until that stage when it becomes the tea of commerce, comprises the following 15 operations:—

1. Plucking.
2. Withering.
3. Rolling.
4. Firing.
5. Rolling.
6. Slight firing
7. Rolling.
8. Blackening process.
9 Cooling and crisping.
10 The last firing.
11 Picking out red leaf.
12 Sifting.
13 Fanning.
14 Picking out stalks.
15 Firing preparatory to packing.

First day

Plucking.—The coolies engaged in this operation are provided with bamboo baskets about 2 feet deep, and a foot in diameter slung over the shoulder by a strip of cane or bamboo.

The young shoots alone are plucked. Let each coolie take a line of tea and see that no trees in that line are left unplucked. Never lose a flush and always take it in time, that is when the new leaves are young and tender. By omitting to pluck the flush *in time* you not only lessen the number and *rapidity* of your flushes, but in order that the tree may *flush again*, you are compelled to pluck leaves which have grown so old and stiff that they are rolled with difficulty and break during this operation.

The planter will require to go daily over his garden for this purpose, as well as to see that no trees have been omitted. Coolies who have been unable to finish plucking their line of tea during the day, are apt to join next day the general gang of pluckers and commence with them in another part of the plantation.

Withering.—Weigh each cooly's leaf as brought in. Scatter the leaves lightly and loosely on "Machans" erected for this purpose. Allow them to wither the whole night. If the leaf when brought in be very wet, when practicable, dry in the sun for a few hours. In dry weather, on the other hand, you must invariably wither in the shade.

Second day.

The next morning take up a handful of the leaves, and if they have an *elastic springy* feeling prepare at once to roll.

3rd. *Rolling.*—The first rolling is the most important. The character of your tea will depend entirely upon the manner in which this operation has been performed. To get a good black tea roll until the leaves present a dark reddish-brown appearance. If, as is sometimes the case in very rainy weather, or with old leaf, you find the leaves obstinate, and time pressing, place 4 or 5 baskets of the rolled leaf one upon the other, or pile in a heap upon a clean sheet. Take care that the leaf does not heat too much, after laying an hour or so turn it all over. The rolling completed, commence firing.

4th. Operation.—*Firing.* Fire till the leaves are slightly crisp, be sure to *fire first* the *leaves first rolled,* and so on in succession.

5th. Operation The leaves crispy from the firing are again placed upon the table and very lightly and quickly rolled for about ten minutes when it undergoes

6th. Operation. Fire slightly after which

7th. Operation. The last rolling takes place.

8th. Operation. Blackening process. The tea is then put into baskets over a *clow clear* charcoal fire and allowed to remain so till slightly black.

9th. Operation. When arrived at this stage it is removed and spread lightly, about 3 inches thick, upon a clean cloth, and left till the next day.

Third day.

10th. Operation. Fire off early in the morning; do not allow your tea makers to burn the tea in the operation. The tea is then carried away either to the storeroom, or the picking department when it undergoes the

11th. process—The red leaf is picked out and then the tea is carried to the sifting room.

12th. *Sifting.*—According to the nature of your tea will depend which sieve you first pass it through. Flowery pekoe is not in great demand, nor save in new factories, worth the attention and care required in its manufacture, especially in factories turning out large quantities of tea. Pekoe will therefore be your 1st quality tea and your first object will be to get out all the Pekoe. Formerly the custom was to sift out all the coarser tea first, but it was found that the numerous siftings requisite to this gave a large proportion of broken pekoe. Having sifted out all your pekoe, you pass the remaining teas through the Pekoe Souchong, Souchong and Congo sieves in succession, bearing in mind always to get out your best teas first.

In sifting for your 1st quality tea, whether it be flowery Pekoe or Pekoe, you will also obtain with it dust and stalk which necessitates the

13th. Operation.—*Fanning.* This is mostly done by women and children, and in exactly the same description of basket and in the same manner as you may daily see the natives fanning their rice.

14th. Operation. The fanned tea is then handed over for the purpose of picking out the stalk; it is then ready for the 15th and last operation, firing previous to packing. Every description of tea undergoes this operation, including dust stalk, broken and red leaf.

Fire slowly for 8 hours as in operation 8. Broken tea and dust &c. require to be fired for 10 hours. Some manufacturers immerse their seedleaf for 4 hours in iron pans filled with water and then fire, thus converting it into a black looking coarse tea which may be mixed with the Congo. I am however no advocate for this plan.

Packing.

The tea is packed as it is fired; tea chests are generally made to contain one md. or 80 lbs. The dimensions of such a chest being 24 inches by 22 inches by 18 inches. The planks should be fully ½ an inch thick. Some planters clamp their chests, which I think necessary only when you are working with unseasoned wood. Every chest should be marked with its quality and quantity.

General Remarks.

Where your outturn of tea is small a "cutcha" tea house, built of mats, with a grass "cheem" roof will answer all purposes. I am of opinion that extensive pucka buildings are an expense which large profit alone ought to warrant. A zinc lined store chest, built upon planked flooring, well raised from the ground, is necessary. Otherwise your tea is apt to get mouldy.

The store room should be erected at a safe distance from the manufacturing house and all other buildings as a precautionary measure in case of fire.

I have considered it unnecessary to give any description of the implements used in manufacture, the same being in general use in all factories.

The sheet lead used in packing is generally procured direct from home.

Information and advice for the Tea Planter from the English market; embracing a description of the various classes of Tea and directions for packing them. By J. H. HAWORTH. ESQ.

OF THE DIFFERENT CLASSES OF TEA.

Teas are arranged in various classes according to the size, make and color of the leaf. I treat first and principally of the Black descriptions, as Green Teas are manufactured in only a few of the Tea growing districts of India.

The following classes come under the name of Black Tea :—

Flowery Pekoe.
Orange Pekoe.
Pekoe.
Pekoe Souchong.
Souchong.
Congou.
Bohea.

various broken kinds,

Broken Pekoe.
Pekoe Dust.
Broken mixed Tea.
Broken Souchong.
Broken Leaf.
Fannings.
Dust.

We occasionally meet with other names, but they are generally original, and ought not to be encouraged, as a few.

simple terms like the above are sufficiently comprehensive to describe all classes manufactured.

Perhaps before entering into a detailed description of the various classes it will be well to explain the term "Pekoe" (pronounced Pek-oh,) which, as we see, occurs in so many of the names above quoted. It is said to be derived from the Chinese words "Pak Ho" which are said to signify white down. The raw material constituting Pekoe when manufactured, is the young bud just shooting forth, or the young leaf just expanded, which on minute examination will be found to be covered with a whitish velvety down. On firing these young leaves, the down simply undergoes a slight change in color to grey or greyish yellow, sometimes as far as a yellowish orange tint.

When the prepared tea consists entirely of greyish or greenish greyish Pekoe, with no or very little dark leaf mixed, it is called Flowery Pekoe.

Flowery Pekoe is picked from the shrub entirely separate from the other descriptions of tea, only the buds and young leaves being taken. In the preparation it is not subjected so severely to the action of heat as the other classes of tea, and generally preserves a uniform greenish grey or silvery grey tint. Its strength in liquor is very great, flavor more approaching that of green teas, but infinitely superior, having the strength and astringency without the bitterness of the green descriptions. The liquor is pale, similar to that of a green tea, and the infused leaf is of a uniform green hue. In many instances where too much heat has been employed we find dark leaves intermixed, and the prevailing color, green, is sprinkled with leaves of a salmony brown tinge which is the proper color for the outturn of any other ordinary black leaf tea. A very common mistake is to call an ordinary Pekoe that may contain an extra amount of Pekoe ends, Flowery Pekoe. When this class of tea is strong and of Flowery Pekoe flavor, it is called by the trade a Pekoe of Flowery Pekoe kind. In

England Flowery Pekoe sells, as a rule, from 4s/6d to 6s/6d per. ℔. One parcel has sold as high as 7s/6d.

By many people the expediency of making Flowery Pekoe is much doubted. The true Flowery Pekoe leaf is the one undeveloped bud at the end of each twig. To pick this alone, without any ordinary Pekoe leaves, involves a great deal of trouble and expense, and I think, though the Flowery Pekoe be very valuable, that the account would hardly balance when we consider the deterioration of the Pekoe by the abstraction of the young leaves.

An ordinary Pekoe is a tea of blackish or greyish blackish aspect, but dotted over with greyish or yellowish leaves which, on close inspection, will be found to possess the downy appearance which gives the name to Pekoe. In general we do not find the whole leaf covered with down, but only part of it, which, in its growth, has been developed later than the other parts. These are called by the trade "Pekoe ends," when very small, Pekoe tips. A Pekoe is generally of good to fine flavour, and very strong, and its liquor dark. Its value is from 2s/9d @ 3s/8d per ℔.

When the Pekoe ends are of yellowish or orange hue, and the leaf is very small and even, the tea is called Orange Pekoe. In flavour it is much the same as an ordinary Pekoe, and many growers do not separate the two varieties, but send them away in the finished state mixed together. Its value is from 2*d* to 4*d* per ℔ more than Pekoe.

The term Pekoe Souchong is generally applied to a Pekoe that is deficient in Pekoe ends, or to a bold, Souchong classleaf, with a few ends mixed. We often meet with it applied to an unassorted tea, including perhaps Souchong Congou, a few Pekoe ends, and some broken leaf. Prices range from 2*s*/3*d* to 2*s*/10*d*.

The name of Broken Pekoe indicates at once what class of tea it is, namely, Pekoe which has been broken in the manipulation or otherwise. It possesses the strength and fine flavor of a full leaf Pekoe, being therefore only inferior to it in point of leaf. In value it is very little inferior to Pekoe, sometimes as valuable, or even more so, as owing to the frangibility of the tender Pekoe ends, they are sometimes broken off in very large quantity, thus adding to the value of the broken tea, though at the sametime deteriorating the Pekoe. Prices from 2s/6d to 3s/4d.

Pekoe dust is again still smaller broken, so small in fact as actually to resemble dust. It is of great strength though often not pure in flavor, as frequently any dust or sweepings from other tea is mixed with it to make the lot larger. The price of Pekoe dust may range from 1s/6d to 2s/8d.

A tea only slightly broken is often called by the planter Pekoe dust; again an orange Pekoe is often called Broken Pekoe, and the converse. A knowledge of the signification of these and other terms would teach the grower to be very careful in marking his teas, as the nomenclature influences to a great extent the sale in the home market.

Having described the finer teas we now come to the consideration of the classes of tea which form the bulk of the manufacture of a garden.

Souchong may be taken as the medium quality, and when experience and skilled labor are employed in the manufacture, as the bulk of the produce of an estate. The qualifications for being comprehended under this term are just simply an even, straight, or slightly curled leaf, in length varying say from half an inch to one and a half inch. It has not the deep strength of Pekoe, but is generally of good flavor, and of fair strength. The prices of Souchong are from 1s/10d to 2s/8d.

Congou comes next. It may be either a leaf of Souchong kind, but too large to come under that class, or though of smallish sized leaf, too unevenly made, or too much curled (so as to resemble little balls) to be so classified. The flavor is much the same as that of Souchong, but the tea has not so much strength. Some of the lower and large leaf kinds may be only worth perhaps from 1*s.* 3*d.* to 1*s.* 6*d.* whereas the finer qualities sell as high as 2*s.* to 2*s.* 3*d.* *per* ℔.

Bohea is again lower than a Congou. It may be either of too large a leaf to be called Congou, or, as is generally the case, it may consist principally of old leaf, which, on being[illegible]ed, does not attain the greyish blackish color which is so desirable for all the black leaf kinds except Flowery Pekoe, but remains of a brownish, or even pale yellowish hue. It has scarcely any strength, and is generally of coarse flavor, sometimes not, but is never of much value unless of *Namuna* kind (a term which will be described hereafter.) We may quote prices at from 4*d.* to 1*s.* 2*d.* per ℔.

We now come to the broken descriptions of these middle and lower classes of tea.

Broken mixed tea is, as its name imports, a mixture of the various kinds of tea broken. It may have a very wide range, include some of the lower classes, or approach Broken Pekoe in character and value, but the kind usually thus named is a tea worth from 1*s.* 8*d.* to 2*s.* 6*d.* generally of a blackish aspect, and containing a few Pekoe ends.

The term Broken Souchong is commonly and appropriately applied to a tea, which, though broken, has some approach to a full leaf, and that of the even Souchong character. Its value may vary, say from 1*s.* 6d. to 2*s.* 2d.

Broken Leaf is a term of great comprehensiveness, but generally is used to signify a tea worth from 8*d.* @ 1*s.* 6*d.* *per* ℔. It may be of a brownish, brownish blackish or blackish color. Its strength is seldom great, but its flavour may be fair or good, but in the lower qualities it is generally poor, thin, or coarse. It would be better to employ this term only as a general name of Broken Tea, and not to use it to signify any particular class, as it is very indefinite.

Fannings is similar in color and class of leaf to Broken

Leaf as described above; in value also much the same, perhaps on the average a little lower. I suppose, in most cases, the mode of its separation from the other classes of tea is, as its name implies, by fanning.

Dust is a very small broken tea, so small in fact as to approach the minuteness of actual dust. It is often very coarse, or "earthy" in flavor, owing perhaps to sweepings and dust having become mixed with it. Its value is from 6*d.* to 1*s.* 6*d.* In any tea of this class worth more than these quotations, a few Pekoe ends or tips will generally be found, which bring it under the name of Pekoe Dust.

We will now look at black Teas in a body and point out what is desirable and what is objectionable in them.

We have seen that all teas which contain Pekoe fetch higher prices than others, consequently we infer that Pekoe is a desideratum. If we glance at the descriptions of the various classes of tea which have been given above, we shall find that it is an element of strength and good flavor. I do not mean to say that any Pekoe is stronger or of better flavor than any tea which does not contain Pekoe, as the soil, the climate, the cultivation, the manufacture and various other causes, may influence the strength and flavor of different teas; but as a rule, in teas that are produced under the same circumstances, the classes containing Pekoe are stronger and of better flavor than those without it.

There is another class of tea which I have not yet described, that possesses very great strength and very fine flavor. This is the class known as the "Namuna kind." All readers of these pages who have been connected with India any time will recognise the word* though they may not quite see how it comes to occupy the position in which we consider it. It is said that its first application in this manner arose from a planter having sent to England some sample boxes of tea with the ticket "namuna" on them. These teas happened to be of the peculiar description which now goes by that name, and which I proceed to describe. The London Brokers have always since then applied the name namuna to this class of tea. The leaf may have perhaps the ordinary greyish blackish aspect with generally a greenish tinge. In the pot it produces a very pale liquor, but on tasting it, its quality belies the poor thin appearance of the infusion. It is very strong, stronger by far than ordinary pekoe; in flavor say about half way between a flowery pekoe and a green tea, quite distinct from the flowery pekoe flavor, possessing somewhat of the rasping bitterness of the green tea class with the flavor a little refined. The outturn is generally green, sometimes has some brownish leaves mixed. Any of the black leaf teas may be of this class, from the Pekoe to the lowest Dust, and all throughout the scale, if the flavor be distinct and pure, may have their value enhanced from 4d to 10d per lb.

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* I need hardly remark that the Hindustani word Namuna, (pronounced Nemoona[illegible]ans sample.

Similar in every respect except one is the Oolong kind. The one wanting quality is the strength, sometimes, by the bye, the flavor is a little different. It may have the greenish greyish blackish leaf (though generally the green leaves are distinct from black ones the tea thus being composed of greyish, blackish leaves with a few green ones intermixed), always has the pale liquor, generally the greenish infused leaf, but sometimes it is sadly intermingled with black leaves, as it is a tea whose flavor is frequently burnt out, though its weakness and green appearance are no doubt often caused by deficient firing. Teas of this kind on the average sell below the ordinarily-flavored teas of the same class of leaf.

In teas of ordinary flavor the following rules hold good :— The darker the liquor the stronger the tea, and the nearer the approach of the color of the infused leaf to a uniform salmony brown, the purer the flavor. Whenever we see any black leaves mixed with it (the outturn,) the tea has been overfired and we may either expect to find the strength burnt out of it, or else to find it marred by having a burnt or smoky flavor incorporated with it,. When you come across an altogether black or dirty dark brown outturn, you may be certain of pale liquor containing little or no strength and no flavor to speak of, unless sometimes it be sour. This is a quality which I shall now touch upon, and regret that I cannot with any certainty give any reliable information whereby the planter may guard against this greatest of faults. It may have various grades,—slightly sourish, sourish, and sour, depreciating the value of the tea say from 3*d* to 1*s*/6*d*. per ℔. The flavor of a sour tea is hardly capable of description. It is not so acid as sour milk; in fact not acid at all, rather a sweet flavor than otherwise being blended with the sourness. It is extremely unpleasant in its more developed grades, and cannot be easily understood except by actual tasting. To the uninitiated this fault is only perceptible in the more strongly marked instances, but to one of the trade the least tendency to it not only condemns the parcel at once, but also causes him to suspect any other lots made at the same or any other time, by the same grower; as it is a curious but unaccountable fact that some two or three gardens (or growers?) almost always produce teas having this fault. I will not cite all the different explanations that have been offered on this subject; I will simply quote the one which seems to have gained most ground and leave those more competent than myself to express any opinion on the subject. The cause assigned, to which I refer is, that the tea leaf after being picked is allowed to remain too long in the raw state before being fired, during which time it undergoes a process of fermentation; some, then, say that this causes sourness, while others maintain that the fermentation is absolutely necessary for the production of a black tea. The fact that we never meet with sourness in a green tea, one feature in the preparation of which being that it is fired almost immediately on being gathered, goes to corroborate this view.

Burntness I have already referred to. As I said before, it may either destroy the strength and flavor altogether or sometimes without destroying the strength, add an unpleasant burnt flavor to it. When the tea has the flavor of smoke about it, it is called smoky or smoky burnt. By being burnt a tea may be deteriorated in value say from 2d to 1s per lb. The symptoms of burntness are a dead black leaf (as opposed to the greatly desired greyish blackish color) having a burnt smell which often entirely neutralizes the natural aroma of the tea. In looking over a broker's character of a parcel of teas you may occasionally meet with the terms "fresh burnt," "brisk burnt" or "malty burnt." These phrases do not carry a condemnatory meaning with them. The meaning of the word burnt as used here, would be better expressed by the term fired. The term malty means of full rich flavor, perhaps from the aroma of this class of tea resembling somewhat that of malt. Teas of the three above descriptions you may have noticed, often fetch very good prices. The meaning of the word "full" applied to a liquor is hardly appreciable except by tasting. It does not signify strength nor flavor, but is opposed to thinness. A green tea may be strong or of good flavor, but its liquor is never full. Fullness is generally characterised by a dark liquor. The quality known as body in a wine is somewhat akin to fulness in a tea. We speak of a "full" leaf tea in contradistinction to a broken leaf. "Chaffy" is generally used in connection with Bohea and other brown leaf classes of tea. A light (in weight) brown, open or flat leaf, in fact one resembling chaff, would be called chaffy. The lower classes of tea, especially the dusts, are often described as "earthy" in flavor. By this a coarse low flavor is understood, perhaps often caused by the admixture of real dust.

When the make of a tea is spoken of, as a "well made" "fairly made" &c. leaf the effect of the manipulation or rolling is referred to. We may have a "well-made even," or a "well-made mixed large and small" leaf. We may have a "straight" or "curled," or as the latter is generally expressed when applied to a large leaf tea, "twisted" leaf. It may be "flattish-made," indicating that though the leaf is not open it wears a flattish aspect, or it may be open, which betrays a want of sufficient or skilful manipulation. A "wiry" leaf is small, perfectly rolled, and very thin (in diameter) generally rather curled, so as, in fact, to resemble small pieces of bent wire. It will be seen at once that only the finer teas can have a wiry leaf, principally the Orange Pekoes and Pekoes. Sometimes we meet with a fine Souchong that may be thus described.

Green Teas.

As in the North West provinces Green Teas form the bulk of the produce, it will be well to give a short description of them though the tenor of my remarks below will shew the general opinion as to the desirability of making them.*

Gunpowder is the most valuable description, its price ranging from 2*s*/8*d.* to 3*s*/8*d.* per ℔. Instead of possessing the long and thin finished leaf which is the desideratum of Black Teas, it is rolled into little balls more or less round, varying from one-eighth to one-quarter of an inch in diameter. Sometimes it is not altogether composed of round leaf, but has some long leaf mixed.

When the Tea is of the shape of Gunpowder, but is larger than the size above quoted, it is called Imperial. Prices of Imperial are from 10*d.* to 2*s*/6*d.*

Amongst Green Teas Hyson may be taken as the parallel of Souchong of the black leaf descriptions. Undoubtedly there is often much young Pekoe leaf in it, but all chance of *discriminating* it in the finished leaf is done away with by the change in color. Hysons sell from 1*s*/2*d* to 3*s*/6*d*.

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* I think I need hardly pause to correct the popular error that the green and black Teas are made from two different species of plant Most of my readers will know that they are both made from the same leaf, the difference lying only in the manufacture.

Young Hyson is smaller than Hyson, occasionally slightly broken. It fetches from 7*d* to 2*s*/6*d*.

Hyson skin consists of the bold broken leaf of Hyson and young Hyson. A small broken Green Tea is seldom sent to the home market. The reason of this is obvious. When we consider that Hyson Skin only fetches from 7*d* to 1*s*/. it is apparent that anything approaching a dust would give very little chance of a profit. I have seen one or two parcels too much broken to come under the title of Hyson skin, sell at 3*d* to 6*d* per ℔ in London. It would be well if some of the Indian planters would take a lesson from the Chinese, and not send home their very low teas, black or green, as they are very difficult of sale in London, and in many cases cannot pay the cost of packing and shipping. The Chinese make a great quantity of their broken teas into Brick Tea and send it into the central provinces of Asia, where it meets with a ready sale. I do not see why this should not be done by the Indian growers. There is a large consumption of tea on the other side of the Himalayas, not very far from Darjeeling and Assam. I hear also, that in the neighbourhood of the tea growing districts, especially the north-west provinces, the natives are beginning to consume largely, and will pay 8 as to 1R/. for a tea that could not possibly fetch more than 1*s*/. to 1*s*/6*d*. per ℔ in England. Whether the natives of India, as a whole, do or do not take to drinking tea, will have a material effect on the future prospects of the article.

Before dropping the subject of Green Teas, I will say a word or two as to the expediency of making Green Tea. I have questioned several experienced people on the subject, but none can tell me their especial object in manufacturing their leaf into green tea. One gentleman told me that he thought that it was because their tea makers (Chinamen) knew better how to make greens than blacks. I have carefully examined the leaf of several of the northwest green teas, and noticing their English sale prices, consider that they would have sold on the average at least 3*d* per lb higher had they been made into black Tea. The best way to test this would be to have green and a black tea made from the same leaf, and then to value the one against the other. I regret that I have never had the opportunity of doing this. We notice that the largest and most experienced producers never make green tea.

I must not pass over Caper without a short description. It is a tea which is made in large quantity in China, though I have only seen one parcel of Indian growth. It forms a link between the black and green descriptions. The color of the leaf is a very dark green, in form it is similar to a Gunpowder, Imperial or round leaf Congou. The liquor is pale and the outturn green, flavor perhaps nearer to that of a green than of a black Tea.

On Damage by Water &c.

As, I regret to say, a rather large percentage of Indian teas sent to England arrives there damaged by exposure, damp or water, or contact with, or being in the neighbourhood of other articles, it will be well to say a few words on the subject.

The term "out of condition," or "0 0 C." as the broker abbreviates it, is oftenest used to signify the milder forms of deterioration, though some people employ it to describe all the various grades of damage by exposure or moisture *viz.* Flatness, Heatedness, Mustiness and Mouldiness.

If you take a small portion of tea and expose it for a day or two, it will become flat. It loses its fragrant aroma; its flavor and strength may go a little, generally not much. I think that most of the teas described as flat in England become so from the chests remaining open for some time before valuing, or that the samples which may have been taken from the chests have been allowed to remain exposed for sometime before examination, this being the broker's fault and not the grower's. Sometimes though, the fault is unquestionably on the other side. Perhaps the chests or the lead or something else was not ready, and the planters godowns were not over air tight, thus allowing the aroma to escape.

A tea that has been packed damp, or become so on the way to its destination acquires a slightly fermented kind of flavor. It is then said to be "heated." Occasionally the tea is found warm, whence most likely the term heated. A flat or heated tea may sell from 3d to 1s per ℔ below the value of tea if sound.

A more advanced grade than the last one described is Mustiness. Here the flavor is altogether destroyed. It may retain its strength, but this avails nothing, as the tea is pretty nearly unsaleable. Not only the flavor but the leaf suffers. It unrolls and becomes covered with white specks.

A 3s 6d pekoe when musty will sell perhaps for 6d, sometimes not so much.

When a tea becomes mouldy it has generally been very much wet, and often we find it caked if dry, or if wet as it generally is, quite hot. The original color of the leaf is not visible, it is covered with white or green mould. The tea (if we may call it by that name) is unsaleable. It may sell for its value as manure, or perhaps for the value of the chest.

I am sorry I cannot exculpate the planter from being the cause of any of the three last named faults. We see that they all arise from being damp. The question then suggests itself—how does the tea become damp? Water or moisture cannot go through lead under ordinary circumstances. There is some defect in the packing which the planter will perhaps recognise on reading the Section "on preparing the teas for despatch."

Then amongst the contagious flavors imparted to tea, we have that of the rosin used in soldering, that of tar perhaps from the tarpaulin on which it may have been laid out before packing, and the acquired "woody" or "sassafras" flavor, the origin of which no body seems to know. Again there are the various "odd" flavors, which no body attempts to characterize. This term, by the bye, is also sometimes applied to a flat or heated tea.

On preparing the Teas for despatch.

Having read the above pages the planter may consider himself qualified to classify the produce of his garden. There are, however, a few hints, which I will proceed to give, which will materially assist him in invoicing and packing his tea.

I will first caution him against arranging his teas in small breaks,* which is pehaps one of the greatest mistakes to which he is liable. It is a very common thing to see similar teas arranged in breaks of six to ten chests, when perhaps there is sufficient tea to constitute a break of fifty chests. I do not know whence the plan originated, but evidently from an ignorance of the manners and customs of the London market. As a rule you will find that the larger the break the better price the tea will fetch in the home market and consequently in that of Calcutta, which is of course governed entirely by the former. Sometimes we have matters a step worse than the above. The tea is divided (or originally made) into small breaks, each differing from the other. Both these systems are very bad. In the one case all the chests should have been arranged together. In the other, the teas of every individual chest should be bulked together, or should never have been separated as the case may be. It is better to despatch a mixed tea (containing perhaps all the various qualities,) if every chest be the same, in a large break, than small breaks, though of even and defined quality. Look at the Assam Company's and other experienced growers' invoices. There we see breaks comprisng one hundred to two hundred chests, instead of one or two chests, which seems to be the fancied desideratum of some. I believe that some planters are in the habit of packing their tea the moment they have made it, for fear of its taking any injury by exposure, and on account of the great benefit which is obtained by packing the tea when warm. This may be one reason for all this apparent division and subdivision. But any chance of spoiling by exposure may be easily obviated by storing in a godown made as nearly airtight as possible, and then as regards the packing when warm, the heat obtained from half an hour's exposure to the sun is quite sufficient. The advantage to be gained is simply to drive out all the inherent moisture so as to prevent any reaction taking place on the tea after packing from dampness. In order to keep the manufactured tea from being exposed, some planters, I believe, use zinc lined bins. Having kept the produce some time thus stored, until it accumulates in sufficient quantity to make in a large garden four or five breaks of forty or fifty chests of each class; or in a small one, one break of forty or fifty chests of mixed or unassorted tea, the tea may be packed. Before packing, the whole must be well turned over several times, so as to ensure a perfct mixing of all that is intended to be included under one break, as there may be very great variations in teas produced from the same leaf, owing to one portion being fired more than another, or other cause. This mixing must be carefully attended to, as it is as great a difficulty to the selling broker, and also as great a bar to the attention of the buyer, to have to separate, and arrange in several small breaks, a parcel of teas which had been invoiced as one break, but which turns out to contain more than one quality, as it is to have to deal with small breaks.

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* "Break" and "bed" are terms emanating from the home trade, used to signify a lot or parcel of similar tea.

There is another fault which can easily be put aside if a little more care and attention be employed. I allude to the mistakes that are so frequently made in marking, which, I fancy, arise in most cases from the prevalent custom of leaving it in the hands of natives. I speak of course of those cases, where, by the general regularity of the breaks, we can infer that the grower knows some thing about tea, and that it is simply through carelessness that any chest be wrongly marked. Sometimes we meet with chests belonging to one break changed by mistake for those of another. I have seen a lot of five chests, thus separated from a break of sixty chests, sell in the London market at 1¼d below the break, though exactly the same tea. This is constantly going on, and the planter or shipper may draw his own moral from it.

We will now consider the chests themselves.

The most common, and perhaps the most convenient chest is one holding about eighty pounds of a medium sized Souchong, of course when a larger or smaller leaf tea is packed in it, it will contain a less or greater quantity, as the case may be. However, this does not matter, as to the London Trade it is pretty nearly immaterial what the nett weight may be of the various chests in a break of tea. It is about the tares that the home people are so particular, therefore it is well to make all the chests in a break, if not in a whole parcel of tea, of exactly the same size, so as to be precisely equal in weight. Some, when their chests do not tare equal, put in small pieces of tea lead or other article to bring up the weight of the lighter chests. This is very well where it is impossible to make the chests uniform, if any such cases exist, but, in general, it will be more satisfactory to all parties who have to do with the tea, and perhaps more remunerative in the end, to the grower, to give a little more attention than is usual to the careful preparation of the chests.

With the view of having their chest even in size, some of the larger growers have the wood for their chests cut to shape in the timber districts, principally at Moulmein. The pieces are then packed as conveniently as possible and sent off, and when they arrive at the plantation, only require putting together, even the dove tailing having been done before being despatched to the tea districts.

Quality of wood.—The thickness of the wood employed in making chests should not be more than five-eights of an inch. If a hard wood be used half an inch of thickness is sufficient. It is not advisable to make use of wood thinner than this, as it is better to err on the side of strength than otherwise. Very thin wood is liable to be split by the nails, and again the native carpenters are rather partial to driving their nails in a direction some degrees out of the perpendicular. It is very common to find the points of about half the nails in a chest, visible, and when these points happen to be in the interior of the chests, they make sad work with the lead the moment the chest is moved. All the joints, except with the lid and bottom, should be accurately dovetailed, and then no clamps are required except across the joints with the bottom. This is one of the greatest advantages that those who use machine-cut pieces have over the man who employs a *chootar mistree* for about a week to turn out a piece of work, through every joint of which when finished one can see a considerable amount of daylight, and which would have been turned out an accurate fit, in a few minitues, by machinery. While on the subject of bad joints, I will point out some of their effects. Sometimes the chest by rough usage or otherwise, owing to the joints being so weak, loses its normal shape, and resembles the thing called a rhomboid, which we used to see in Euclid at school, or perhaps it is just simply bulged out, the joints having given way. After this the lead goes, and when the grower receives his account sales from home, he finds there has been a large loss in weight, and that the tea which remains is out of condition. Again we often see, in chests otherwise very well made, that the joints of the several two pieces of wood composing the sides, frequently coincide at the corners of the chest as in Fig. 1. This, no doubt is done with the view of being uniform and neat, but when the chest is lifted by the upper part, the top comes off having nothing to hold it on except the two or three nails, which are used to join each two pieces composing a side, and from off which the upper part slides with the greatest ease the moment the weight of the tea is left resting on the lower part as in Fig. 2. Consequently no such chests should be sent off the plantation without clamps being placed across the horizontal joints. The best way to make the chest is as follows. We will take for example a chest whose sides are twenty two inches high. If wood could be procured so wide, it would, of course, be better to make each side of one piece, but as this is seldom the case, we have to consider how we shall make the best joint from two pieces of wood. The following breadths, in the size of chest above mentioned answer very well. Make the top piece eight inches wide and the lower one fourteen, then in the next side reverse matters, putting the smaller piece at the bottom,—and so on in the next two sides as in fig. 3. By making the chest thus, we have six inches between the horizontal joints, and the intermediate dovetails bind the joints so strongly as to render clamps unnecessary. The two pieces composing a side may be joined by a tongue and groove, or by two or three double pointed nails :—nothing very strong is required, as the joint has only to resist lateral force, any weight acting in a vertical direction having no influence on it. Having

fig 1

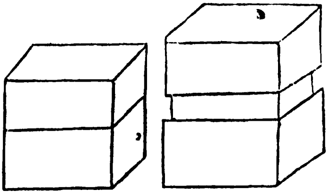
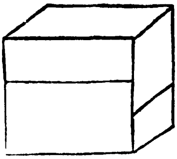


fig 3



taken care that the whole of the upper part is perfectly square, the bottom may be put on. I mentioned the desirableness of its being quite square in every way, in order that when the bottom is fastened on, it will not draw any of the joints. It should be first nailed on, and then three or four clamps applied on each side, great strength being here required, as the whole weight of the tea rests upon it. The clamps used should be about one sixteenth of an inch thick, and the length of the nails used to fasten them not quite so great as the thickness of the wood, as, if only a very little of a nail project into the interior of a chest, as soon as it is moved, the lead is sure to get torn into a hole. I must here protest against the quantity of nails which some planters use for putting together their chests. Instead of strengthening the chest it weakens it by splitting the wood. I declare that I have seen in a chest prepared by one of the first Companies in Assam, forty seven nails used to fasten on the lid alone, whereas twenty are quite sufficient.

When the chests are strongly made, as shown above, there is no necessity to use split cane or matting, which we sometimes see employed to strengthen them. When the tea is not to be sold in Calcutta, it may be well to encase the chests with gunny. The practice of putting on strengthening bars outside the chest condemns itself as owing to tea being shipped by measurement the charge for freight is much increased on account of the chest occupying so much more space.

A package containing from forty to fifty pounds is called a half chest, and one which holds less than this, a box. It is not advisable to pack in these small packages, unless the tea be very fine, when sometimes it will fetch extraordinary prices for private consumption.

We generally see tea packages oblong. I do not know why, as I should think it would be rather an advantage to have them of the form of a cube.

Before leaving the subject of chests, I will describe a method proposed by a gentleman of Calcutta, for strengthening the corner joints of tea chests. This is to have a three cornered bar of wood down each of the angles formed by the junction of the sides as in figure 4. It may be made thus. Prepare a bar of hard wood as long as the chest is deep, of section about one and a quarter inches square. Saw this diagonally the whole length. You will then have two pieces of the required dimensions. You can then nail to these from each of the sides composing the several corners, using a good long Paris point, which may be clenched on its having penetrated the whole thickness. By using these corner pieces any chance of the chest bursting is obviated, unless the wood give way.

fig. 4

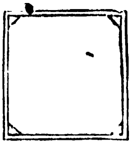
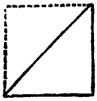


fig. 5



When the chest is finished, it should be carefully examined before proceeding to line it with lead, care being taken that the face of the wood be even, and that no nails project into the interior, as anything of this kind soon makes sad work with the lead when the chest is moved. The lining should be made to fit the chest exactly, or perhaps a little larger than the chest, so that there may not be any danger of its being burst by the tea. Great care should be taken in the soldering, as moisture can penetrate through the smallest gap that may be left. Old lead is somtimes difficult to solder owing to the oxide that may have formed on it. This is easily remedied by scraping the parts to be joined with a knife till they are bright and none of the coating remains. There will then be found no difficulty in soldering. There is one kind of tea lead that will hardly solder at all. It seems to be a mixture of lead and paper. It is very thin, weak and brittle, and altogether very undesirable. I think that any extra expense that may be gone to in procuring a good thick pliable lead will be fully repaid.

On packing the tea the chest should be well filled, and then shaken, and the tea pressed down several times. Some chests on arriving in England, are found to be only about three quarters full, owing, no doubt, in most cases, to the tea not having been originally tightly packed. The consequence is that a large extra charge for freight is incurred, and that the lead is often worn through by the frequent moving and turning over that the chest undergoes in its passage to the home market.

Having packed the tea and soldered up the lead, the lid may be put on. It may consist of two or three pieces of wood, which, however, should not be joined by a tongue and groove, or by double pointed nails as in the sides, as in opening the chest afterwards, the lid would be liable to be split, especially if only part of it be opened. Having fastened it down with a moderate number of nails, the chest may be marked. It is convenient to the broker to have the chest marked on the top and one of the sides, so it is better to do thus, as it involves very little extra trouble and expense. The plan of putting a marked paper ticket on the chest does not answer well, as when it gets exposed to any moisture, it generally comes off. The best plan is to use the ordinary marking ink, with metal plates with the required marks cut out in them. All the marks that are required are the growers mark, the season, class of tea, break number, chest number, and the nett weight and tare, thus.

A B
1866
Pekoe
Br. no.
Nett wt.
Tare

As I said before it is well to number the chest from upwards throughout the season. When a gunny covering is used; mark this on the lid of the chest inside the gunny, and on the side outside it.

In the case of the Calcutta merchant shipping teas bought in Calcutta, he adds his own mark. If the mark of the grower be favourably known in the home market, he retains it. If it do not possess any reputation, there is no necessity to use it. Whilst on the subject of Calcutta shippers, I will make the remark that tea, as an article of merchandize, will never gain ground until more care is taken in the packing before export. Tea is an extremely delicate article, and perhaps more susceptible of damage than any other staple, and the merchant is continually receiving advices from home that such and such chests in a shipment were out of condition on arriving there. Perhaps the remark is added that when the chest was opened in Calcutta, it had not been properly soldered up, or perhaps that a hole had been torn in the lead by the point of a nail. The Tea trade is comparatively a new line of business in Calcutta and it will have to be carefully nursed before it can compete with the other established articles of export.

Of the characters of Tea from the different districts.

Before going into this subject I must premise that three different kinds of plant are grown in the Indian Gardens,—the "Indigenous," the "Hybrid" and the "China" varieties. I will also add that wherever they are grown, as a rule they retain the following properties in liquor.

The Indigenous is very strong and full. Liquor very dark.

The Hybrid is a modification of the above.

The China not very strong, but of an aromatic or scented kind of flavor.

The districts of Assam and Cachar may be stated to be planted out chiefly with the Indigenous and Hybrid varieties: whereas the stock of Darjeeling and the North-West is chiefly China. I do not know whether it is to this that we are to refer the cause of the characteristic flavors of the teas from these several districts, or whether to the soil or climate. Perhaps they all have some influence. We may take the following to be the character of the several infusions :—

Assam very strong, flavor characterised by the absence of anything approaching the peculiar scented aroma of China tea ; liquor full and dark.

Cachar very strong, flavor astringent, liquor not so dark.

Darjeeling not strong but flavory, similar to China, liquor not remarkable.

North-west Provinces. A little strength, flavor similar to Darjeeling.

As strength is the desideratum of Indian teas it will be seen that the produce of Assam and Cachar will be most esteemed. I think that the general opinion that Assam Teas are better than Cachars is a mistake. Assam has more experienced growers and therefore, perhaps, on the whole turns out better tea, but that does not prove that better tea can be made from the Assam plant than from the Cachar. The opinion of several of the most experienced London Brokers is in favor of the Cachar Teas. The weak point in the Darjeeling Teas is that, possessing as they do, a flavor similar to that of China tea, and having very little strength, they are brought to the level of China teas, of which there is generally a plentiful stock in the home market, and consequently do not obtain anything like the extraordinary prices realized by the Assam and Cachar teas. There is a very large consumption of Tea in the North-West districts, and as the quantity hitherto produced has been very small, only trifling lots of the Tea produced in these neighbourhoods, have found their way to the home market. The prices obtained for these have only been fair, but I think that when any large breaks of well made Tea begin to arrive, that the status of the Teas of this district will materially improve. As some of the teas that arrived first in London from the North-west were from the district of Kumaon, the whole of the teas grown in the North-west have always been known by the name of Kumaons in the home market.

The teas from the district of Hazareebaugh, where cultivation is going on now on a very large scale, are a link between Assams and Kumaons. Owing to the extreme cheapness of land and labour, this neighbourhood promises very well as a tea growing country.

From Chittagong and Akyab I have seen teas which could not be known from a Cachar tea. Land being very cheap there also, I think it a very good field for the Tea planter.

The few Teas from the Neilgherries that I have seen have the China flavor very strongly marked.

By the following tables the home prices which are equivalent to the several Calcutta values, all charges being paid, may be found.

As stated at the head of the tables the freight is taken at £4 10s. If freight be obtained at lower rates, you can give a higher price in the Calcutta market: as follows,

Freight	at 4 £,	add	·133	annas.
"	" £3-10s.	... ...	·266	"
"	" 3 £	... ...	·400	"
"	" £2-10s.	... ...	·533	"
"	" £2	... ...	·666	"

Freight. £4 10s.

E. X. C. H. A. N. G E.

Home.	1-11.	11¼.	1-11½.	1-11¾.	2-0.	2-0¼.	2-0½.	2-0¾.	2-1.	2-1¼	2-1½.	2-1¾.	2-2.
s. d.	as.	as.	as.	as.	as.	as.	as.	as.	as.	as.	as.	as.	as.
5	1·40	1·36	1·33	1·30	1·27	1·24	1·21	1·17	1·14	1·10	1·07	1·04	1·01
6	2·05	2·01	1·97	1·93	1·89	1·85	1·81	1·77	1·73	1·69	1·65	1·61	1·60
7	2·69	2·64	2·59	2·54	2 50	2 45	2·41	2·36	2·32	2·27	2·23	2·18	2·14
8	3·33	3·27	3·22	3·17	3·12	3·06	3 01	2·96	2 91	2·85	2·80	2·75	2·70
9	3·98	3·92	3·86	3·80	3·74	3·68	3·62	3 56	3·50	3·44	3·38	3·32	3·26
10	4·62	4·55	4·49	4·42	4·36	4·29	4 22	4·16	4·09	4·02	3·96	3·89	3 82
11	5·26	5·18	5·11	5.04	4·97	4·89	4·82	4·75	4·68	4·60	4·53	4·46	4·29
1-0	5·91	5·83	5·75	5·67	5·59	5·51	5·43	5·35	5·27	5·19	5·11	5·03	4·95
1-1	6·55	6·46	6·37	6·29	6·21	6·13	6·04	5·95	5·86	5·77	5·68	5·60	5·51
1-2	7·20	7·10	7·01	6·91	6·82	6·72	6·63	6·54	6·45	6·35	6·26	6·17	6·08
1-3	7·84	7·74	7·64	7·54	7·44	7·34	7·24	7·14	7·04	6·94	6·84	6·74	6·64
1-4	8·48	8·37	8·27	8·16	8·06	7·95	7·84	7·74	7·63	7·52	7·42	7·31	7·21
1-5	9·12	9·00	8·89	8·78	8 67	8·55	8·44	8·33	8·22	8·10	7·99	7·88	7·77
1-6	9·77	9·65	9·53	9·41	9·29	9·17	9·05	8·93	8·81	8·69	8·57	8·45	8·33
1-7	10·41	10·28	10·15	10·02	9·90	9·77	9·65	9·52	9·40	9·27	9·15	9·02	8·90
1-8	11·06	10·92	10·79	10·65	10·52	10·38	10·25	10·12	9·99	9 85	9·72	9·58	9.45
1-9	11·70	11·56	11·42	11·28	11·14	11·00	10·86	10·72	10·58	10·44	10·30	10·16	10·02
1-10	12·34	12·19	12·05	11·90	11·76	11·61	11·46	11·31	11·17	11·01	10·86	10·71	10·56
1-11	12·98	12·82	12·67	12·52	12 37	12·21	12·06	11·91	11·76	11·60	11·45	11·30	11·15
2-0	13·63	13·47	13·30	13·15	12·99	12·83	12·67	12·51	12·35	12·19	12·03	11·87	11·71
2-1	14·28	14·11	13·94	13·77	13·60	13·43	13·27	13·10	12·93	12·77	12·60	12·43	12·27

2-2		14·92		14·74		14·57		14·40		14·22		14·05		13·88		13·70		13·53		13·36		13·18		13.01		12.84
2-3		15·56		15·38		15·20		15·02		14·84		14·66		14·47		14·29		14·12		13·94		13·76		13.58		13.40
2-4	1	0·20	1	0·02		15·83		15·64		15·46		15·27		15·08		14·90		14·71		14·52		14·34		14.15		13.96
2-5	1	0·84	1	0·65	1	0·45	1	0·26	1	0·07		15·88		15·68		15·49		15·29		15·10		14·90		14.70		14.51
2-6	1	1·49	1	1·29	1	1·09	1	0·89	1	0·69	1	0·49	1	0·29	1	0·09		15·89		15·69		15·49		15.29		15.09
2-7	1	2·13	1	1·92	1	1·72	1	1·51	1	1·30	1	1·09	1	0·89	1	0·68	1	0·48	1	0·27	1	0·06		15.85		15.65
2-8	1	2·78	1	2·56	1	2·35	1	2·18	1	1·92	1	1·71	1	1·50	1	1·29	1	1·07	1	0·85	1	0·64	1	0.42	1	0·22
2-9	1	3·42	1	3·20	1	2·98	1	2·76	1	2·54	1	2·32	1	2·10	1	1·88	1	1·66	1	1·44	1	1·22	1	1.00	1	0.78
2-10	1	4·06	1	3·83	1	3·61	1	3·38	1	3·16	1	2·93	1	2·70	1	2·47	1	2·25	1	2·02	1	1·79	1	1·56	1	1·34
2-11	1	4·70	1	4·47	1	4·24	1	4·00	1	3·76	1	3·53	1	3·30	1	3 08	1	2·84	1	2·60	1	2·37	1	2·13	1	1·90
3-0	1	5·35	1	5·11	1	4·87	1	4·63	[illegible]	4·39	1	4·15	1	3·91	1	3·67	1	3·43	1	3·19	1	2·95	1	2·71	1	2·47
3-1	1	5·99	1	5·74	1	5·50	1	5·25	1	5·00	1	4·75	1	4·51	1	4·26	1	4·01	1	3·76	1	3·52	1	3·27	1	3·03
3-2	1	6·64	1	6·38	1	6·13	1	5·87	1	5·62	1	5·37	1	5·12	1	4·86	1	4·61	1	4·36	1	4·10	1	3·85	1	3·60
3-3	1	7·28	1	7·02	1	6·76	1	6·50	1	6·24	1	5·98	1	5·72	1	5·46	1	5·20	1	4 94	1	4·68	1	4·42	1	4·16
3-4	1	7·92	1	7·65	1	7·39	1	7·12	1	6·85	1	6 58	1	6·32	1	6·05	1	5·78	1	5·52	1	5·26	1	4·99	1	4·72
3-5	1	[illegible]56	1	8·29	1	8·02	1	7·74	1	7·47	1	7·19	1	6·92	1	6·64	1	6·37	1	6·10	1	5·83	1	5·56	1	5·28
3-6	1	9·21	1	8·93	1	8·65	1	8·37	1	8·09	1	7·81	1	7·53	1	7·25	1	6·97	1	6·69	1	6·41	1	6·13	1	5·85
3-7	1	9·85	1	9·56	1	9·28	1	8·99	1	8·70	1	8·41	1	8·13	1	7·84	1	7·55	1	7·26	1	6·98	1	6·70	1	6·41
3-8	1	10·50	1	10·20	1	9·91	1	9 62	1	9·33	1	9·03	1	8·74	1	8·45	1	8·15	1	7·86	1	7·56	1	7·27	1	6·98
3-9	1	11·14	1	10·84	1	10·54	1	10·24	1	9·94	1	9·64	1	9·34	1	9·04	1	8·74	1	8·44	1	8·14	1	7·84	1	7·54
3-10	1	11·78	1	11·47	1	11·17	1	10·86	1	10 55	1	10·24	1	9·94	1	9·63	1	9·33	1	9·02	1	8·71	1	8·40	1	8·10
3-11	1	12·42	1	12·10	1	11·79	1	11·48	1	11·17	1	10·85	1	10·54	1	10·23	1	9·92	1	9·60	1	9·29	1	8·98	1	8·66
4-0	1	13·07	1	12·75	1	12·43	1	12·11	1	11·79	1	11·47	1	11·15	1	10·83	1	10·51	1	10·19	1	9·87	1	9·55	1	9·23
4-1	1	13·71	1	13·38	1	13·05	1	12·73	1	12·40	1	12·07	1	11·75	1	11·42	1	11·10	1	10·77	1	10·44	1	10.12	1	9·79
4-2	1	14·36	1	14·02	1	13·69	1	13·35	1	13·02	1	12·68	1	12·35	1	12 02	1	11·69	1	11·35	1	11·02	1	10·69	1	10·36
4-3	1	15·0[illegible]	1	14·66	1	14·32	1	13·98	1	13·64	1	13·30	1	12·96	1	12·62	1	12·28	1	11·94	1	11·60	1	11·26	1	10·92
4-4	1	15·64	1	15·29	1	14·95	1	14·60	1	14·26	1	13·91	1	13·56	1	13·21	1	12·87	1	12·52	1	12·17	1	11·82	1	11·48
4-5	2	0·28	1	15·92	1	15·57	1	15·22	1	14·87	1	14·52	1	14·16	1	13·81	1	13·46	1	13·10	1	12·75	1	12·39	1	12·04
4-6	2	0·93	2	0·57	2	0·21	1	1 ·85	1	15·49	1	15·13	1	14·77	1	14·41	1	14·05	1	13·69	1	13·33	1	12·97	1	12·61
4-8	2	2·22	2	1·84	2	1·47	2	1·09	2	0·72	2	0·34	1	15·97	1	15·60	1	15 23	1	14·85	1	14·48	1	14·11	1	13·74
4-10	2	3·50	2	3·11	2	2·73	2	2·35	2	1·96	2	1·55	2	1·17	2	0·79	2	0·41	2	0·02	1	15·63	1	15.24	1	14·86
5-0	2	4·79	2	4·39	2	3·99	2	3·59	2	3·19	2	2·79	2	2 39	2	1·99	2	1·59	2	1·19	2	0·79	2	0·39	1	15·99
5-2	2	6·08	2	5·66	2	5·24	2	4·83	2	4·42	2	4·01	2	3·60	2	3·19	2	2·77	2	2·35	2	1·94	2	1.53	2	1.12

Freight £4 10s.

E. X. C. H. A. N. G. E.

11-1.	11-1¼.	111-½.	1-11¾.	2-0.	2-0¼.	2-0½.	2-0¾.	2-1.	2-1¼.	2-1½.	2-1¾.	2-2.
Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.
2 7·36	2 6·93	2 6·50	2 6·08	2 5·66	2 5·23	2 4·80	2 4·37	2 3·95	2 3·52	2 3·09	2 2·67	2 2·24
2 8·65	2 8·21	2 7·77	2 7·23	2 6·89	2 6·45	2 6·01	2 5·57	2 5·13	2 4·69	2 4·25	2 3·81	2 3·37
2 9·94	2 9·48	2 9·03	2 8·57	2 8·12	2 7·66	2 7 21	2 6·76	2 6·31	2 5·85	2 5·40	2 4·95	2 4·50
2 11·22	2 10·75	2 10·29	2 9·82	2 9·36	2 8·89	2 8 42	2 7·95	2 7·49	2 7·02	2 6·55	2 6·08	2 5·62
2 12·51	2 12·03	2 11·55	2 11·07	2 10·59	2 10·11	2- 9 63	2- 9·15	2- 8·67	2- 8·19	2- 7·71	2- 7·23	2- 6·75
2- 13·80	2- 13·30	2- 12·81	2- 12·31	2- 11·82	2- 11·32	2- 10·83	2- 10·34	2- 9·85	2- 9·35	2- 8·86	2- 8·37	2- 7·88
2- 15·08	2- 14·57	2- 14·07	2- 13·56	2- 13·06	2- 12·55	2- 12·04	2- 11·53	2- 11·03	2- 10·52	2- 10·01	2- 9·50	2- 9·00
3- 0·37	2- 15·85	2- 15·33	2- 14·81	2- 14·29	2- 13·77	2- 13·25	2- 12·73	2- 12·21	2- 11·69	2- 11·17	2- 10·65	2- 10·13

Invoice of 165 Chests of Tea shipped by the undersigned, per Str.—— ———— from

———— and Consigned to Messrs. ———— of Calcutta.

Mark.	Class of Tea.	Br. No.	No. of Packages.	Nos. of Packages.	Tare.	Nett Wt. of each Chest.	Total nett wt. of Break.	
AB	Flowery Pekoe,	1	10 (Half chests.)	1 @ 10	25lb	50lb	500lb	
do.	Pekoe, ...	2	30 (chests.)	11 @ 40	35lb	80	2,400	
do.	Souchong, ...	3	50 do.	41 @ 90	35lb	75	3,750	
do.	Congou, ...	4	40 do.	91 @ 130	35lb	70	2,800	
do.	Broken Pekoe,...	5	15 do.	131 @ 145	35lb	85	1,275	
do.	Fannings, ...	6	20 do.	146 @ 165	35lb	85	1,700	

Total 165 packages containing ... ... 12,425lbs of Tea.

———— *th* 186 .   *Signed* ————

Never use the Indian Weights in your Invoices, as they are liable to cause great confusion, especially when they find their way to England.

Always be very careful in Weighing and Taring. It should be remembered that tea generally loses weight before its sale in England, so perhaps it may be well to give half a pound or so over weight as buyers will always remember any mark of tea whose chests have been short of weight.

By the foregoing tables the prices that may be paid in Calcutta for Teas of the several home values in the margin may be estimated.

The following charges have been deducted :—

Charges which are equal on all classes of Tea.

Covering with Gunny, Hackeryhire, shipping &c.,	·074 annas.
Customs Entry, Dock charges, Public sale do., Fire Insurance,* interest on charges &c., ...	·533 do.
Freight at 4 £ 10 per ton of 50 c. ft. or say 8 chests, ...	1·200 do.
	1·807

Charges being percentages on the value of the Tea.

Calcutta Brokerage, ...	1 per cent.
Home, do.	1 per cent.
Ditto Commission, ...	2½ per cent.
Marine Insurance, †	3 per cent.
Total,	7½ per cent.

When freight can be obtained at lower rates higher ra may be paid, as follows :—

When at	4£ add	·133 anna.
„	3£ 10s.„	·266 „
„	3£ „	·400 „
„	2£ 10s.„	·533 „
„	2£ „	·666 „

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* Fire insurance is such a small [illegible] that I have not put it in amongst the percentages, but as a small standing charge.

† As insurance is generally effected to about 20 per cent. above the value 2½ on 120 will be equal to 3 on 100.